THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. AUGUST 12, 1897. CHICAGO, ILL. NUMBER 32.

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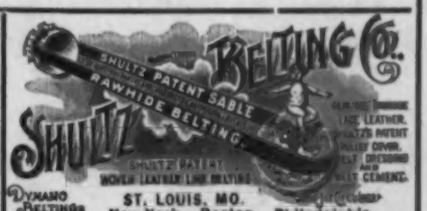

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On Page 25.

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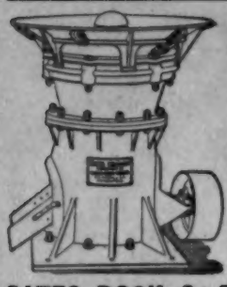

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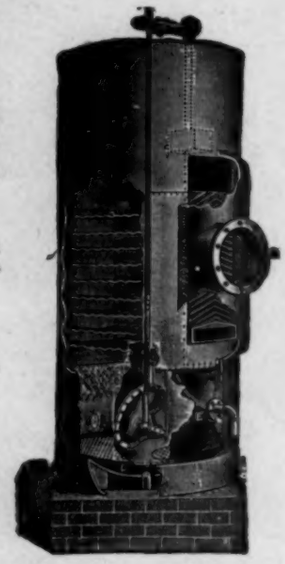

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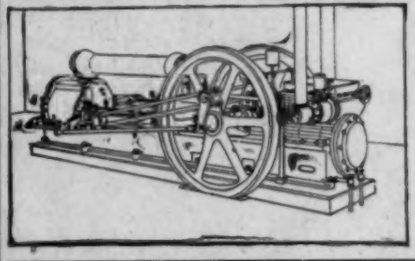

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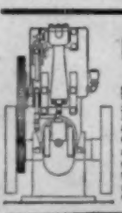

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THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. AUGUST 12, 1897. CHICAGO, ILL. NUMBER 32

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Improvement talk continues in the iron trade, varying all the way from the reports of those who find a broadening market, with signs of still better buying ahead, to the less buoyant opinions of that element which regards present betterment to be largely sentimental though conceding a much improved prospect. Buying is undoubtedly of larger proportions than at any time in July. Whatever the causes, the first ten days of August have seen more activity than the like period in a number of years, leaving out 1895. While some branches have not shared in the buying movement to as great an extent as others, there is no dissent from the belief that the iron trade will have its full share of the quickening now evident in other lines, but entirely absent in 1895. Those who measure prosperity by the size of advances in prices will be skeptics for some time to come. So far as pig iron is concerned, barring the slight advance on end-of-the-year deliveries of two or three round lots of Bessemer sold two weeks ago, there is no indication of betterment of price. Increasing production and large stocks will require strong demand to lift values. On foundry irons the East has been a particularly weak spot. While foundries seem to be making a little gain in the amount of work on hand, there are enough weak sellers to keep prices on foundry grades on a level. The heavy output of steel works is a continuing feature of encouragement. The larger producers, particularly in the Pittsburg and Chicago districts, are crowding capacity to the utmost in some departments, and their sales in the past two months are evidently larger than has been generally supposed. But here and there complaint is heard that in keeping tonnage up to the top notch the big mills are pushing harder than ever for whatever is in sight, and that a mill of average equipment, unless running on specialties, stands little chance. Not until business can overflow a little from the greater mills will there be even a modest advance in prices of finished material, and then it will come because the unfilled mills must have it to run without loss. The feature of the immediate demand upon rolling mills in all lines is the multitude of small orders from buyers who have not been heard from for some time—boiler shops and machine shops that have been idle or running intermittently, and the small consumers of bar iron, sheets and plates, that have repair work and new work on hand that must be pushed in the remaining months of good weather. In the Chicago district some orders for bars have been placed on car account, and counting foreign contracts in the former, locomotive and car works are better employed than for some time. The iron ore trade, which had been quiet for some time, has had a small revival of demand in the past ten days, and some further business is pending. Leaving out prices, which while steadier on a few products, are generally at the lowest point, the whole situation is an encouraging one and expectations are strengthended by daily developments in crops in the West and larger clearings and stronger stock markets in the East.

THE CLEVELAND DISTRICT.

Since Aug. 1 there has been a revival of ore buying which in July was scarcely a measurable quantity. It is probable that upwards of 300,000 tons has been taken in the last ten days, Bessemer and non-Bessemer grades being represented. Gogebic and Marquette ores lead in the tonnage taken, though all ranges were represented. On some ores sellers are beginning to count the probabilities of increased lake freights in naming prices and the offers of early season months would not be duplicated now, in all cases. However, for some non-Bessemer contracts recent competition has been quite keen, and $2.50 for a hard non-Bessemer running 65 per cent in iron has been done, while soft old-range ores outside the Bessemer limit range from $2 to $2.25. The vessel situation is firmer even with coal eliminated. Little coal will move this month and the business will be crowded into about 10 weeks. Grain rates have advanced slightly and on ore to Oct. 1 some 60-cent business has been done, to the head of the lake. To Nov. 1 ore shippers have offered 65 cents It appears that considerable tonnage has been tied up on ore and with the heavy grain movement expected from this time out, wild rates in October are counted on to be quite advantageous to vessel men.

Pig Iron Offers on Bessemer iron for the balance of the year have been made by steel works in the past week, but while $9 business can doubtless be done for prompt delivery, furnacemen are quite unanimous in standing for $9.25 in the valley for the last quarter. It is understood that this figure has been offered in one case, on deliveries running through the first four months of 1898. The large current output of Bessemer steel leads the furnaces to expect a fair amount of buying for the last quarter. Foundry iron shows no change for the better. On No. 2, $9 in the valley has been shaded in several instances, though on valley softeners $9.25 is held by some producers. Gray forge has been sold at $8 in the valley, or more than $1 below the quotation on Southern iron. Lake Superior charcoal has shown some little activity, low prices being quoted in competition with Bessemer for malleable work. We quote f. o. b. Cleveland:

Bessemer	$ 9 65	Valley Scotch No. 1	$10 40@10 65
No. 1 Strong Foundry	10 25@10 65	Valley Scotch No. 2	10 00@10 15
No. 2 Strong Foundry	9 60@10 15	Gray Forge	8 65@ 8 75
No. 3 Foundry	9 25@ 9 50	Lake Superior Charcoal	12 25@12 75

Steel Billets. Two Cleveland buyers of billets have been in the market lately. A sale of 15,000 tons is reported at $13.85, Cleveland. An inquiry for 5,000 tons is out, but the contract has not been given as yet.

Finished Material. The aggregate of small orders is of fair proportions, but all the small business is keenly competed for. On heavy sheets low quotations are reported and 1.15c, Pittsburg, is done on No. 12. Boiler works are evidently busy, a good demand being noted for boiler steel. Galvanized work is also a factor in current demand. In the valleys the mills are chiefly occupied with agricultural contracts taken some time ago. Some desirable export orders have been taken by the valleys of late and some early developments in export business now pending are expected for the Cleveland district.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, Aug. 11.

The week has brought no special change in the situation. Sales have not been large, but still have been very satisfactory, and the outlook for the future is fully as good as it was a week ago. In pig iron circles trade has been lighter than in the preceding week, and the larger part of the business closed was taken by the local furnaces. The demand keeps up well, and there are still a number of good inquiries in the market to be filled. The railroads are commencing to figure on cars, and within the last two weeks two orders of 1,000 cars each have been placed with Western car builders, together with two or three smaller orders. Further contracts are expected within the next month. The material for the car orders is being closely contested for, but the competition has not had the effect of reducing prices. Rails, billets and rods are selling well in small quantities, and the local mills are well filled with orders. No large contracts for structural material have been placed, but the general trade in small lots is very good. Plates are in good demand, most of the sales being for small lots.

PIG IRON.—Local furnaces closed most of the business in this territory last week, Southern sellers reporting a very small trade, and a light inquiry. Nearly all the deals closed were for small lots, but the aggregate made a fair tonnage, although not up to that of the week previous. Good inquiriers are in hand and denote a continuance of buying at the same rate that has prevailed in the past few weeks, for some time ahead. September buying is still an unknown quantity, but the dealers are looking for a good trade, basing their hopes principally on the generally better tone to trade, and the fact that buying by the general jobbing foundries has not been especially heavy for some time. Quotations are unchanged, and are very firm.

Lake Sup. Charcoal	$13 00@13 25	South'n Coke No. 3	9 60@ 9 85
Local Coke Fdy. No. 1	10 50@10 75	Southern No. 1 Soft	$10 35@10 60
Local Coke Fdy. No. 2	10 25@10 50	Southern No. 2 Soft	9 85@10 35
Local Coke Fdy. No. 3	10 00@10 25	South'n Silveries	10 35@10 60
Local Scotch Fdy. No. 1	10 50@10 75	Jackson Co. Silveries	12 50@14 50
Local Scotch Fdy. No. 2	10 25@10 50	Ohio Strong Softeners	12 00@12 25
Local Scotch Fdy. No. 3	10 00@10 25	Alabama Car Wheel	15 50@16 00
South'n Coke No. 1	10 75@11 00	Malleable Bessemer	10 75@11 00
South'n Coke No. 2	9 85@10 10	Coke Bessemer	11 50@12 00

BARS.—The placing of several orders for cars two of them for lots of 1,000 each, has stimulated buying of bars to some extent. The Illinois Central has bought 1,000 cars, and the Northwestern has placed an order for the same number. General business in bars is fairly good, and the mills are not making any concessions in the way of prices. The signing of the scale by the bar mills will increase the active capacity in this district, but it is not expected to have any effect on prices. Quotations are made at 1.10c to 1.20c for both common iron and steel bars from strictly billet stock, and 1.20c and up for guaranteed iron.

RAILS AND TRACK SUPPLIES.—Sales were not large last week, but were satisfactory, and included orders for both light and heavy sections. The market is firm, and prices are unchanged. Quotations are made: Rails, 19 to 21, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

BILLETS AND RODS.—A number of small orders have been taken for billets and rods aggregating a good tonnage. The business being closed is taken at much higher figures than those made on the Cleveland sale of week before last. Quotations are still made at $15 for billets, and $21 for rods.

STRUCTURAL MATERIAL.—General business in small lots is good, last week's total making quite a large tonnage. No large contracts were closed. The market continues firm. Quotations are made as follows: Beams and channels, 1.15c to 1.20c; angles, 1.10c to 1.15c; plates, 1.10c to 1.15c; tees, 1.30c to 1.40c. Small lots from stock are quoted one-quarter to one-half cent higher.

PLATES.—The local mills are doing a good business every week, principally in small orders, though one or two of quite good size were closed last week. The ship plates spoken of lately have not yet been closed. Quotations are very firm as follows: Tank steel, 1.10c to 1.20c; flange steel, 1.30c to 1.35c; fire-box steel, 1.85c to 5c.

SHEETS.—There has been a slightly better demand, and orders last week were more frequent and of larger size. Quotations are made at 1.90c to 2c for No. 27 black, and 80 and 5 to 80 and 10 per cent discount for galvanized.

MERCHANT STEEL.—Several noteworthy contracts were closed last week, both from store and for mill delivery, in addition to a number of small lots. Quotations are as follows: Open-hearth spring, tire and machinery steel, 1.60c to 1.70c; smooth finished machinery steel, 1.50c to 1.55c; smooth finished tire, 1.35c to 1.40c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—Not much was done last week in general scrap. There were some sales of old rails, close to the figures we give. The demand has fallen off a little. The quotations below represent dealer's asking prices for material: Old iron rails, gross ton, $11.25 to $11.50; old steel rails, gross ton, 7 to $7.50; old wheels, gross ton, $10 to $10.25; railroad forge, net ton, $10.50 to $11; dealer's forge, net ton, $9 to $9.50; No. 1 mill, net ton, $7.50 to $8; heavy cast, net ton, $7.50 to $7.75; malleable cast, net ton, $8 to $8.50; axles, net ton, $13.50 to $14; cast borings, net ton, $2.75; wrought turnings, net ton, $4 to $4.50; axle turnings, net ton, $5.50 to $6; mixed steel, heavy, gross ton, $6.25; stove plates, net ton, $5.50 to $6; heavy melting steel, gross ton, $7 to $7.50; old iron splice bars, gross ton, $11 to $11.25.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, Aug 11.

The more independent stand taken by selling furnaces and especially by finishing mills is noteworthy in the slowly changing conditions in steel products. Prices heretofore subject to revision—frequently a radical one—are no longer flexible nor is there undue haste to sell. On future business there is a general disposition to hold off and long deliveries are avoided. The volume of transactions for early delivery is strong and gradually increasing. A feature of the week is the announcement that girder rails will be rolled at the Homestead Steel Works.

PIG IRON.—Sales of foundry and mill irons occurred in the week, but none of any consequence in Bessemer. Some heavy buyers in the Pittsburg district have been sounding the market and flat offers have been made on 5,000 and 10,000 ton lots but under terms that assured a rejection. The year's wants were represented in the tonnage asked for, and there is some inquiry, also, for deliveries into next year. Pittsburg furnaces are not at all anxious to contract very far ahead and bid accordingly. Gray forge sold at $8.25 for 1,000 tons and No. 2 foundry again fell to $9.25—several 100-ton lots and one of 200 going at the price named. Nothing has occurred to change quotations, which are made as follows:

Bessemer at valley furnace	$ 9.00
Bessemer delivered Pittsburg District	9.35 to 9.50
No. 1 Foundry	10.25 to 10.50
No. 2 Foundry	9.50 to 9.75
No. 3 Foundry	9.00 to 9.25
Gray Forge	8.25 to 8.50

BILLETS.—Cleveland is once agian the center of activity in steel and the sale of 15,000 tons said to have been made from the valleys at $13.85 delivered in Cleveland, is the most conspicuous transaction of the week. It is assumed by buyers that if the terms of recent sales be authentic, present valley quotations of $13.75 and $14 would be materially lowered on early deliveries. Local mills ask $14 to $14.25, at mill and as a rule are not anxious to accept long deliveries. Quotations obtained, on future deliveries, however, are not materially in advance of to-day's prices.

PLATES.—There is little inclination to lower first asking prices and the attitude of plate mills is more independent. Prices named by mills follow: Tank, Bessemer, 1c to 1.05c; open-hearth, 1.05c to 1.10c; shell, 1.20c to 1.25c; flange, 1.25c to 1.30c. The tonnage for August bids fair to better July.

STRUCTURAL MATERIAL.—City bridge work is a feature of local business, three contracts having been awarded. The first is to Gustave Kaufman, the others to the Schultz Bridge & Iron Works. Outside work coming to local mills is featureless but of good aggregate. On beams 1c is minimum, and 1.05c to 1.10c is asked on small specifications. Plates and angles hold at 95c to 1c.; tees and zees, 1.15c to 1.20c.

RAILROAD AND TRACK SUPPLIES.—The difficulty encountered in rolling rails at Duquesne which threatened for a time to prevent further rail operations there has been remedied, and rails are again being turned out. Last week billets were rolled. The Carnegie Steel Co., Ltd., is looking into the advisability of rolling girder rails at the 33-inch mill at Home-

stead, and will probably be active in the girder rail market before long. On track material quotations are made as follows: Splice bars, 1.10c to 1.15c; track bolts, iron, 1.65c to 1.70c; steel spikes, 1.45c to 1.55c. Links and pins are quoted at 1.20c to 1.25c.

MERCHANT STEEL—The season orders are now largely filled and the tonnage coming in is small. Jones & Laughlins have issued a new card of prices on shafting which is much lower than the preceding list. Purchases of shafting are very small in size. We quote: Open-hearth spring, 1.35c to 1.40c; open-hearth machinery, 1.15c to 1.20c; machine-straightened tire, 1.25c to 1.30c; soft steel bars, 1.25c; toe calk, 1.35c to 1.40c; sleigh shoe, 1.25c; tool steel, ordinary, 5c to 7c; branded, 10c and upwards.

IRON AND STEEL SKELP.—Some increase can be seen in the aggregate purchases of skelp but no indications of better prices are in sight, except that quoted prices are firmly held: Grooved steel skelp, 92½c to 95c; sheared steel skelp, 1c to 1.05c; grooved iron skelp, 1c to 1.05c; sheared iron skelp, 1.15c to 1.17½c.

FERRO-MANGANESE.—Domestic, 80 per cent, is quoted at $45 to $45.50.

PIPES AND TUBES.—Higher asking prices on pipe, casing and tubing are being well held. Occasional concessions by hungry mills have not so far caused a general return to low prices. Discounts are made as follows: Merchant black, 57 to 67 per cent off; galvanized, 52 to 55 per cent off; six tens for less than carload lots, six tens and two and a half per cent on carload lots. Advanced prices on boiler tubes, as agreed on last month in New York, have been generally maintained as follows: Two and a quarter inch and smaller, 75 per cent discount; two and a half inches and over, 75 and 10 per cent discount. The following quotations on casing are firmly maintained: Screw and socket joint, 62½ per cent discount; inserted joint, 57½ per cent discount.

BARS.—There has been business placed in considerable quantities since the settling of the puddling scale. As usual, valley mills have taken much of the available tonnage in common bar iron. Prices are quoted at 95c, valley, but Pittsburg mills stand firm at 1c. Muck bar is quoted at $17.50. Steel bars hold at 95c to 1c, but these prices are not as flexible as recent quotations.

SHEETS.—Sheet mills are not all in working order yet and complaints are common from many quarters because of breakdowns and delays. Consequently there has been trouble in filling orders already booked, deliveries on which were retarded by the wage disagreement. Prompt deliveries have been hard to secure and in some gauges the condition has almost been a famine. Strange to say, however, prices on prompt deliveries did not advance. Future delivereis are higher but there is still eagerness to cover for 1897, and necessary concessions are being made. Galvanized sheets sold in the week at 80 and ten per cent off list, with freight allowance. On black sheets the following prices are asked and firmly held: No. 26, 1.80c to 1.85c; No. 27, 1.90c to 1.95c; No. 28, 2c to 2.05c.

OLD MATERIAL—Sales of old material occur at intervals but generally lack new features. Two lots of 500 tons each, of old iron and steel rails brought in the week $11.50 and $9.45, gross, respectively. Smaller transactions involved exchanges of railroad wrought iron, wrought turnings, heavy melting stock and cast borings. No. 1 wrought commands about $11 gross, and cast, about $8.25 to $8.50, gross.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Philadelphia Some improvement in the volume of iron and steel sales is apparent, with prices trailing at the low level of previous weeks. Yet sellers are confident enough of the future to hold rather more firmly to quotations. In pig iron buyers are not taking hold with any indication that an early advance is expected. Concessions would probably secure considerable business, since it is generally agreed that general conditions will bring improvement in iron and that the market is now at the bottom. But sellers are not willing to tie themselves up for the next 12 months at even a slight reduction below recent transactions, which, particularly on Southern iron, have been quite in the buyer's favor. We quote seaboard prices: No. 1x foundry, $11.75 to $12.50; No. 2x, $10.75 to $11.25; No. 2 plain, $10.25 to $10.50; standard mill irons, $10; ordinary mill irons, $9.50 to $9.75. Billets are quoted $16 to $16.25, but there is little doing. Sellers expect better prices in the near future and are not pushing for farther forward deliveries. Finished material markets show fair demand in all departments and the aggregate of business closed is quite encouraging, particularly since it is made up of widely distributed orders of small to medium size. The feeling is better, but until the mills are better filled up, prices are not likely to advance. We quote: Bar iron, 1.05c to 1.15c; special bars, 1.20c to 1.25c; soft steel bars, 1.05c to 1.15c; plates, 1.10c to 1.15c; angles, 1.10c to 1.15c; beams, 1.15c to 1.25c.

Cincinnati. The demand for pig iron the past week has been moderate, but healthy. There is an absence of any speculative tendency, but there is confidence in a steady, strong market. Consumers look for improvement and believe that if they pay advanced prices later on, they will secure correspondingly higher values for their products. The coal strike has not seriously interrupted business thus far, and the supply of coke has been ample for requirements. The market is steady, with hardening tendency in figures for soft foundry grades, which are in active request. Mill irons are still weak and rolling mills starting up have been able to cover their wants at advantageous figures. An Indiana sale of 2,500 tons of gray forge is reported close to $6 Birmingham. Rolling mills in this district that started up early in July on a conditional scale have had a fair run of prompt orders, though no large tonnages are reported closed. On bar iron 1.10c to 1.15c is quoted, and on sheets 2c to 2.05c for No 27. Old material is quiet, with $8.50 asked for wrought scrap, $6 for cast scrap and $9 for iron rails.

Advantages of Galvanized Steel.

That galvanized sheets which are made of steel with the oxide formed in rolling removed, and then coated with spelter, are not more generally used in boiler and tank works is because the advantages thereof are not sufficiently understood. The extreme cheapness of steel plate and improvement in manipulating same has been followed by the general substitution of steel plate stacks and chimneys for brick. It is, however, well for boiler makers to remember that the action of moisture, especially when impregnated with sulphur arising from soft coal, has a destructive influence on steel plates, rusting rapidly, particularly in the lighter gauges. This may be delayed by frequent painting or varnishing. The coating of spelter on steel sheets is impervious to moisture, and therefore the life of the metal is preserved indefinitely, especially where it may be painted with the ordinary commercial stack or boiler paints. We would remind boiler makers that unless they call the attention of their customers to this fact, they will find a large and profitable part of their business leaving them on account of the short life of the ordinary steel stack as now made, because the first cost of the brick chimney will be of less importance than the inconvenience and cost of having to replace the steel stack or chimney. We called attention to this fact some two or three years ago, and are constrained to speak of it again by the complaints of some of our customers who realize the danger mentioned. This is confirmed by the fact we are getting more and more orders for iron plates which seem to withstand the action of the atmosphere better than steel.—[Boiler Maker.

H. M. PRIEST, receiver of the Brilliant Tube & Pipe Works, Brilliant, O., sold the property of the company at receiver's sale at Steubenville, Aug. 9. It was bought for $35,000 by the Wheeling Title & Trust Co., trustees for the first mortgage bond holders. The property includes the rolling mill and equipment and 526 acres of coal lands.

THE Valley Limestone Co., of New Castle, Pa., has been chartered. Several prominent iron men are included among the incorporators, who are Kennedy Andrews, of Warren, O.; John Reis, Garnet Reis, James W. Reis, and W. E. Reis, of New Castle.

FIRE did $1,500 damage last Saturday to the Beaver Falls, Pa., plant of the American Axe & Tool Co. The fire is believed to be of incendiary origin.

THE Standard Mfg. Co., of Pittsburg, will build a 228x60 warehouse adjoining their present plant in Allegheny.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

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AUGUST 12, 1897.

PROSPECTS FOR FOREIGN TRADE IN IRON.

Special interest and importance attach to the opinions expressed in other columns of this issue by manufacturers of iron and steel, as to the outlook for export trade in the products of our furnaces and mills. While we would have liked to give the name of the writer in each case, we recognized at the outset that in some instances a freer expression would be obtained where the contribution was anonymous, and therefore have been satisfied to make the personal element in this correspondence secondary to the presentation of the concensus of prominent iron masters on a topic to which they are all giving thought. Some of the expressions to be published later will likewise be given with the name omitted.

The prominent fact in connection with the installment of opinions presented to-day is the general agreement in the belief that our exports of iron and steel are to be a permanent factor. With all allowance made for the present low basis of prices at home and the higher than average prices prevailing abroad, particularly in the United Kingdom, it is accepted as the destiny of the United States to become prominent at length as a supplier of the world's wants in iron and steel.

Interesting facts brought out in the correspondence are the efforts made last year, without success, to arrange for rebates on Lake Superior iron ores entering into exported products, and the statement of a wire nail manufacturer as to the plans along similar lines which are about to be worked out in Germany, to head off American nail manufacturers in Japan.

A suggestion at the close of another letter is worthy of note, namely, the possibilities of retaliatory legislation in countries that are particularly made to feel the effects of American competition in iron and steel. That the exports we have made thus far are awakening protests, appears in what is given on another page, reflecting English comment on the rail order for India, taken by the Maryland Steel Co. What the Southern shipments of pig iron are doing in Spain appears from a review of the Spanish iron trade under date of July 30, which says: "The American pig iron scare is responsible once more for a fall in prices, and manufacturers here are beginning to desire fervently a speedy improvement in the iron and steel trades in the States, which, it is hoped, will keep American manufacturers employed at home and prevent them seeking an outlet for their surplus make in Europe." That British manufacturers are thinking of some such action as is being discussed in Germany may be inferred from this sentence from the London *Iron and Coal Trades Review's* comment on our new tariff on iron and steel: "We do not appear to be far from the time when the iron trade of this country might be justified in asking for some sort of reprisal against the United States."

On the question whether it is feasible to make a rebate on iron ores entering into our iron and steel products that go abroad there is a diversity in the views of our correspondents. If such prosperity should come in time to the United States, as to bring any material advance in prices, iron ore producers would undoubtedly seek to get their share. However, it is fair to say that it would be a very considerable boom that would cause an increase of even $1 a ton in finished material on account of the enhanced value of the ore entering into it. The iron ore business is now on such a basis, with consumers of ore so large a factor, that an advance of even 25 to 50 cents a ton would be a serious handicap on the average buyer in any but a time of high prices for finished products.

It would appear that with ocean freights frequently rising to a prohibitory point, and the probability of iron and steel prices in Great Britain and Continental countries coming closer to our own, as the foreign boom recedes, and prosperity comes to the United States, we must not count on a large or a regular business with Europe in the near future. The largest expansion in outer trade is to be looked for with those countries to which Great Britain, Germany and Belgium must pay a considerable freight. That we will eventually get a large share of business in South America, China, Japan, and other neutral markets, to which the freight on European exports would be nearly if not quite as much as our own, seems as well assured as anything that belongs to the future can be.

THE delegates from the British Iron Trade Association who visited German and Belgian iron and steel works in 1895 reported that while in equipment they did not excel and often did not equal British works, they had two advantages over manufacturers in the United Kingdom. These were lower transportation charges and a greater measure of freedom from the exactions—often burdensome and unreasonable—of labor organizations. That this latter handicap is still a heavy one is evidenced by the presidential address of E. Windsor Richards, at the opening of the Institution of Mechanical Engineers at Birmingham, Eng., recently. In the published report occurs this paragraph:

At the summer meeting held in Bristol, in 1877, the president (Mr. Thomas Hawksley) in his address took a gloomy view of the realtions existing between employers and employed, asserting that our labor was too dear for successful competi-

tion with foreign countries, too dear in respect of the quantity of work performed, and too dear in respect of the obstructions and restrictions which the modern workman thought fit to place upon his employment and employer. After a lapse of 20 years these words seem even more applicable to the present state of those relations than they were at the time they were written.

Undoubtedly the restrictions of unionism as it has become entrenched by years of control in the engineering trade and other lines of industry, go far to offset the advantage of low wages which England has over this country. The complaints of her manufacturers in this regard will grow louder, as the advantages of cheap raw materials, particularly fuel, and low transportation rates, enjoyed by our manufacturers, assert themselves more and more in competing with Great Britain for neutral markets.

THE paper of Mr. D. H. Bacon, president of the Minnesota Iron Co., read at the recent meeting of the American Institute of Mining Engineers, as given elsewhere, gives occasion for reference to the highest price at which Lake Superior ores have sold. Mr. Bacon mentions $18, Pittsburg, as the highest point reached, in contrast with the prices of 1897, which are the lowest. It is within the recollection of gentlemen connected with one of the oldest iron mining companies, that a few small sales of Marquette ore, for mill fix, were made early in 1873, just before the opening of navigation, at $18, Cleveland. It is also a matter of memory that a small lot of Republic ore for fix, was sold early in the '70s at $16.25, Cleveland, the freight to Pittsburg being $1.50. The highest season's average we have found was $12.17, that being the record of the Cleveland Iron Mining Co. for 1873. The highest price reached on Republic and Champion ores was $12.50, Cleveland, or $14, Pittsburg, in 1880. However, later in the same year this price was rebated to $10, on the falling off of the boom of 1879-80, furnacemen representing to the ore companies that to enforce the $12.50 contracts would simply ruin them.

Economies of Pig Iron Casting Apparatus.

Reference was made in our last issue to the effort of several furnace interests to devise a pig iron casting and conveying apparatus that would save them from paying the license fee on the system that is now prominently before furnace companies. Our attention is called in this connection to the fact that the license fee of $5,000 charged for the use of the Uehling machine, when divided by the ouput of even an ordinary furnace, during the 15 years the patent has yet to run, will give a very small license cost per ton, which is not the considerable portion of the resultant saving our paragraph intimated. For example, 75,000 tons a year for 15 years would give a total output of 1,125,000 tons, or less than one-half cent per ton for a $5,000 license. On the other hand a saving of $25 a day is figured by the use of the machine, or ten cents a ton on a 250-ton output. The cost of original equipment is figured at one and a half to two cents per ton of metal, during the life of the patent. This expense, however, is of course the same whether the user be a licensee or whether the apparatus in use be developed by his own experimenting.

Personal.

W. C. Catlin has resigned as superintendent of the Joliet works of the Illinois Steel Co., and is succeeded by C. L. Miller, of Chicago.

E. L. Ford, general superintendent of the Youngstown Steel Co., has returned from a European trip.

IRON AND STEEL EXPORTS.

Views of Manufacturers as to Their Permanence.

Without doubt the uppermost question to-day, with the iron trade of the United States, is whether our exports of pig iron, rails, steel billets, sheet and tin plate bars and various forms of finished material will keep up in equal or increasing volume. Much has been said by the press concerning the American iron and steel campaign for outer markets. The manufacturers themselves have been heard from but little. To learn their opinions *The Iron Trade Review* is sending out letters of inquiry in which these questions are asked in substance:

1. Is our export trade in iron and steel likely to continue and grow?

2. In case the present low price of Lake Superior ores should be raised, to give a profit to mine, vessel and railroad interests, and better wages to employes, would it be feasible and desirable to make an arrangement by which steel makers shall receive a rebate from mining companies on such ore as enters into exports

3. What legislation by Congress or what action by American manufacturers will aid most in the extension of our trade abroad, particularly in iron and steel?

The first instalment of replies received is given below. As the purpose of the letter was to secure as free an expression as possible, it was stated that while these individual opinions were sought for publication, names would be omitted if a request were specially made. In a few cases it has been necessary to comply with such a request.

General Manager of the Brier Hill Iron & Coal Co.

J. G. Butler, Jr., general manager of the Brier Hill Iron & Coal Co., of Youngstown, O., writes:

I agree with you that the uppermost question to-day in the minds of the iron and steel factors is the export of our pig iron and resultant products. I do not think it would be feasible or desirable to make an arrangement which would enable steel manufacturers to receive a rebate from the ore mining companies on such ore as enters into exports. The large manufacturers of steel, notably the Carnegie people, the Laughlins, the Oliver-Snyder Co., the Cambria Iron Co., and several other minor organization are now very well fixed for their ore supply and can count on a large percentage of their requirements at a substantially fixed price for a long series of years. I believe that we shall be forced to continue making iron and steel at low prices. The present price is abnormally low, and in many cases is lower than is necessary for export.

I think the only legislative action to be taken by Congress is to have in view the extension of our shipping trade. I believe that Congress should subsidize our shipping the same as is done in the old countries and direct lines should be established to the important ports. At present our export business is dependent almost wholly upon foreign bottoms and the rates are fluctuating and uncertain. I believe that, if we are not now, we soon will be the greatest manufacturing country on the face of the globe, and that it is absolutely imperative that we should extend our export business. Whether or not a concert of action on the part of the manufacturers would produce better results than individual enterprise, I am not prepared to express an opinion.

President of the Illinois Steel Co.

John W. Gates, president of the Illinois Steel Co., which has had no small share of the export trade in rails and in crude steel, writes:

In my opinion the export sales of pig iron, rails, steel billets, sheet and tin plate bars and the various forms of steel material, will continue to increase year by year. The trade relations of the United States will continue to expand, and with cheap ore, cheap coke (which is bound to exist for many years to come), low transportation, and a gradual equaliza-

tion of wages as between this country and Europe, the United States is bound to take the lead in the manufacture of iron and steel for sale in all parts of the world.

The greatest handicap that the American manufacturer is laboring under to-day, is the fact that freight rates from American ports to foreign ports are very much higher than they are from European ports. This comes largely by the subsidizing of steamship lines from Europe to all parts of the world. What America needs most to do to extend her commerce, is to subsidize steamship lines all over the world. There is no reason in the world, in my judgment, why there should not be regular liners from New York to every port on earth; and the same might be said to be true of Philadelphia, Baltimore, Boston and New Orleans. When this time arrives, and Congress sees fit to grant a subsidy and encourage American shipbuilding as it should be encouraged, no nation on earth can compete with the United States in the manufacture of iron and steel. We have immense quantities of high-grade ore which can be mined and transported at very low figures. We have the best quality of coke which can be produced at a much lower price than anywhere else in the world; and with our labor-saving devices we can pay a higher scale of wages and yet compete with any other nation.

The question of tonnage cuts a more important figure in the manufacture of steel in this country than it does abroad. The foreign manufacturer seeks to make a smaller quantity at a higher profit while the American manufacturer endeavors to make the larger quantity at the lower profit.

The iron ore combination made a great mistake of judgment when they put the price of ore as high as they did for 1896 delivery. They did it against the earnest protest of the largest consumers of ore in this country. While there is no great profit to-day to the owner of an ore mine, who mines ore and pays the transportation by rail and by lake, still to the two largest ore producers who have their own lines of railroad and steamships there is a handsome profit in the present prices of ore, in my judgment. Certainly the percentage of profit in mining ore, based upon the price at which Mesabi ores are selling, is far greater than the profit on a ton of pig iron and much better than the percentage of profit on coke, pig iron, billets or rails.

In the spring of 1896, Mr. H. C. Frick, of the Carnegie Steel Co., and myself made a strong argument to the Bessemer Iron Ore Association, to get a reduction on all ore the product of which went into steel which was sold for export. After a thorough consideration, the association concluded it was not wise to grant this concession. We did not ask it alone for our respective companies, but for all parties who manufactured goods for export. I believe the Iron Ore Association has since seen the force of the argument made by us in March or April, 1896. I do not believe the prices of iron ore will ever again touch the fictitious figures at which it sold for 1896 delivery.

Small profits and large sales must be the motto of the iron and steel manufacturers of America from this time forward, in my judgment; and only those plants which are favorably located and thoroughly modern and are operated at their fullest capacity can make money. Such plants will be able in years to come to make a fair return on the capital invested.

I look for a gradual increase in the price of finished material. As it now looks to me, 1898 will be one of the best years the iron and steel business has had for many years. By this I do not mean extravagantly high prices, but fair living profits; and if the railroads of this country that have outside mines located on their lines, do not take care of the interests of the mine owner, it will only be a short time until the two companies above referred to, who own their railroads, mines and fleet of steamers to transport the ore, will be doing all of the iron ore business in this country.

With good crops, fair prices for them, tariff matters settled, a better feeling among the capitalists of this country caused by the seeing of an able Republican President; both Houses of Congress Republican (although the Senate by a bare majority), I believe we are coming into an era of better times. I sincerely hope it will not terminate in any large boom in prices.

A Central Western Wire and Wire Nail Company.

The following is from an officer of a wire and wire nail company that has built up a foreign trade:

We think it feasible that a plan be arranged whereby parties making finished product would receive a drawback from the steel makers, who, in turn, could receive a drawback from the ore miners, on goods that were made for export. During the past ten months we have succeeded in securing a large portion of the nail trade of Japan from the German makers, and we know that for the past three months the German makers have been working on a combination whereby they will take this trade away from us again, the idea being to allow a bounty of about $2.50 per ton on export orders up to 60,000 tons per annum. Half of this rebate is to be borne by the makers of steel billets, the other half by the pig iron and coal people. As this in many cases is more than the entire profit we make in this export business, it needs no argument to show that our manufacturers in order to keep up our tonnage, make the product cheaper, and keep our own labor in employment, should adopt some such plan.

We do not think legislation could be had that would answer the purpose; and, further, it would be so slow that by the time it was secured the trade would all have been taken away from us, and the plan now proposed by the German manufacturers adopted.

A Central Western Manufacturer of Finished Iron.

The secretary and treasurer of an important interest, manufacturing a large line of specialties in finished iron, says:

It is true one of the uppermost questions in the minds of the iron and steel trade (particularly the latter) to-day, is as to whether the exports of pig iron, rails etc., are to be continued and on what basis. We are of the opinion that the export trade has hardly begun, and we certainly believe that with the low cost of manufacture in this counrty, and with the increasing cost abroad, we shall be able to secure quite a percentage of the foreign trade—sufficient, possibly, to take up the surplus of American manufacture and give us a fair price for material furnished to our home consumers.

The foreign business, however, will doubtless have to be done on about cost lines. The Lake Superior ore men, the furnacemen and steel plants should join with the finished manufacturers in making special prices so as to enable the American manufacturer of finished goods to compete for the foreign trade. It may be necessary for the ore producers, vesselmen, furnacemen and steel plants to do this business at cost.

What this country needs, perhaps, as much as anything else, to enable us to secure the foreign business, is better shipping facilities. We have few bottoms in which to forward our material, depending largely, if not entirely, on foreign ships to transport our products. Congress should take some action looking to the building up of our merchant marine, and to protect it afterwards, in the way that England and other foreign countries do.

We have had a great many inquiries from abroad for material for shipment to all parts of the world, and have been successful in securing some trade. We have just been advised of the acceptance of a proposition we made on 1,100 tons of material to go to South America. We trust that the good work has just begun and that we will be enabled to secure a large percentage of the foreign business in the near future.

President of the Oliver Wire Co.

George T. Oliver, president of the Oliver Wire Co., Pittsburg, whose expressions on industrial questions have always shown careful study, contributes the following:

I have no doubt that with proper treatment on the part of our business men, our manufacturers and the Government, the present large volume of our export trade in iron and steel products can not only be maintained, but can be almost indefinitely increased.

I think, in the first place, that the attention of the manufacturers should be directed to the export, not of crude products like pig iron, steel billets and tin plate bars, which are simply used by our competitors in other countries as raw material for the manufacture of more advanced articles, but of the finished products which are made from them, and which

we should endeavor to ship direct to the various points of ultimate consumption. To accomplish this, it will be necessary for each manufacturer to find out what is wanted in his particular line of manufacture in other countries, and then he should set to work to make such article in the shape they want it, and not in the shape in which he would prefer to make it.

Another requisite to continuous and successful intercourse with consuming nations, especially with the Central and South American States, is the establishment of an international bank with branches in the principal Latin-American cities, whose especial attention should be given to the facilitating of commerce between the United States and the various countries in which the branches are located. In London alone, there are 60 banks whose sole function is the conduct of international finance as related to commerce. All these banks have agencies and branches in various parts of the world. As a consequence, the trade of all these countries must be filtered through London, and other countries receive only the orders which British manufacturers find it unprofitable to fill.

The first thing for the Government to do is to negotiate reciprocity treaties in accordance with the provisions of the new tariff law. This will undoubtedly be done, but reciprocity will be of little avail unless supplemented by closer financial relations and ampler means of communication between the United States and the various Latin-American countries. To facilitate such intercourse the Government should provide for liberal mail contracts with steam ship lines plying between our ports and South America.. With increased intercourse, both personal and financial, we should absorb a large part of the trade of these countries. During the past year, our exports to Brazil, Argentine, and the Spanish West Indies, amounted to only $30,000,000, while during the same period we bought from them products to the value of $126,000,000. The balance against us, nearly $100,000,000, we were compelled to remit in gold to Europe, to pay for goods which these countries bought from Europe, most of which, however, might just as well have been bought from us.

I do not think it would be either feasible or desirable to provide for a rebate to steel makers on such ore as enters into exports. If the price of ore remains open, there is no question of our ability to compete. If, on the other hand, a combination is formed among the mine owners, the very necessity of building up an export trade will restrain them from demanding extortionate prices; and it is entirely practicable for American manufacturers, with plants favorably situated, and well managed, to pay a price for ore that will yield a reasonable profit to the mine owners, and stilll compete upon favorable terms with European makers in the markets of the world —and this, too, without making any serious inroads upon labor. To do this, however, we must both sell and ship direct to the various points of destination, and not pay tribute on every ton to the financial and mercantile middle men of London. As long as the present situation continues, with cheap ore and fuel, efficient modern plants, and fair wages, the trade of the world is ours—but not simply for the asking. We must grasp it with a firm hand, and hold it with a strong arm.

In the May number of the *Forum* there appeared a very able article on "Our Export Trade," written by Mr. Charles R. Flint, of New York, in which many of the views I have above outlined are expressed at greater length and in much better shape than I have been able to give them. I recommend it to those of your readers who are interested in this important subject.

A Pennsylvania Manufacturer.

A gentleman connected with a large Pennsylvania concern writes:

I believe our export trade will continue to grow, but incline to the opinion that it will be a steady rather than rapid growth, increasing each year as our manufacturers become more familiar with the business and its requirements, and the facilities for conducting the business become more adequate, as they are bound to. It seems to me most convincing to look back only a few years and recall the almost universal conviction at that time on the part of the manufacturers and political economists, that this country could never expect to export any of its manufactured products in which the element of labor entered largely into the cost. That this belief was not well founded is evidenced to-day by the fact that our exports are largely products in the manufacture of which labor *is* the principal item of cost, such as stationary engines, electrical machinery, etc., and the prices received for these products are, generally speaking, entirely satisfactory. I cannot bring myself to believe, as some do, that our export trade is but a temporary expedient, and at the most can only be used to take care of our surplus product without hope of profit. I venture the opinion that the profits resulting from the exportation of manufactured articles, with the exception of iron and steel in its cruder forms, are to-day quite as satisfactory as those resulting from sales made in our own markets, and in a number of instances I know them to be much more so. We have made rapid progress in the development of our export business during the past three or four years, and against conditions that would have seemed insurmountable if they could all have been enumerated before an attempt was made. Having gone thus far, and with such success, is it reasonable to suppose that we are going to abandon the position we have fought for and won? Such a course is not characteristic of America and Americans. There need not be a very considerable increase in the price of raw material to yield operators a fair profit on their investment. The cost of lake transportation need not be increased a great deal to satisfy vessel owners. The railroad interests are now getting all that is necessary to pay a fair profit on actual capital invested, and railroads, as well as private enterprises, must get ready to do business on this basis.

As far as labor is concerned, I have no hesitation in expressing my conviction that it would be prosperous and entirely satisfied with the rates prevailing generally throughout the country, if it could be given constant employment; and it is to this continuity of employment, not only of labor, but of our factories and mills as well, rather than to high wages, and high rates of profit, that we must look for prosperity in the future. And this can only come, it seems to me, through an enlargement of our field of operations and the opening up to us of the markets of the world for such of our products as nature has made it possible to produce in this country cheaper than anywhere else.

I believe every producer of iron ore will agree with me, that the prices fixed by the Bessemer Iron Ore Association at the opening of navigation in 1895 would be eminently satisfactory to-day. We have seen coke from the Connellsville district selling at 85c and 90c a ton on cars at the ovens. If it was possible to manufacture and sell coke at that time at these prices, without loss, it would seem that the present price might be shaded materially and still yield a fair profit to the manufacturer. It would be necessary to make a readjustment of the wages of the miners in the Connellsville district; but I believe that they were fairly prosperous when coke sold at 85c and 90c a ton, and wages were proportionate, if they were given steady employment.

As far as costs are concerned, I for one am far from convinced that our possibilities in this direction are measured by those of the present time. During the past four or five years we have made great strides in lowering them, much greater than any of us ever dreamed possible, and I believe that in the next period of depression, which is bound to come sooner or later, we will find it possible to go even farther, and I think a good deal farther, in the same direction.

I have not given much thought to the feasibility of a rebate on ores used in the manufacture of articles for export, but it seems to me manufacturers might, with entire propriety, ask for it, and with equal propriety request the railroads to make special rates to the seaboard on the same articles. There are many difficulties in the way of the exporter that are still to be overcome, but I do not believe any of them to be insurmountable. Chief among them at present is the lack of a merchant marine, but this will come in time.

I shall not presume to suggest the course of legislation best calculated to further and foster what I have gradually come to regard as the key to our future prosperity; but it seems to me that one of the things to be feared most is the enactment of retaliatory legislation by the countries whose markets are now open to us. We can scarcely expect free access to these markets if we shut them out entirely from our own, and it seems to me that eventually we shall find it wise to adopt Mr.

James G. Blaine's plan of reciprocity, or something closely akin to it.

Vice-President of the Tennessee Coal, Iron & Railroad Co.

James Bowron, vice president of the Tennessee Coal, Iron & Railroad Co., who has written at various times on the question of iron exports from the Birmingham district, makes this answer:

The chief impediment to the extension of our exports of iron and steel, and the chief danger under future adverse conditions to the maintenance of the present trade, lies in the deficiency of suitable ocean freight accommodation. The greatest impetus that could be given to exports would be supplied by legislation in the matter of establishing steamers to important countries with subsidies for carrying the mails. I know myself of many thousands of tons of iron that could be shipped to India, South Africa, Australia, Argentine, Chili, and Brazil, if direct lines of steamers were established between South Atlantic or Gulf ports and these countries.

As such development of the American marine must necessarily be slow, export facilities could be increased by the building or chartering of steamers, either by combinations of manufacturers or by railroad systems, which steamers should play the same part in foreign export business under the management of the railroad traffic departments, as is now played by steamers under similar arrangements in our coastwise business.

Raliroad companies now find it profitable to control steamers between coastwise points, both for the freight and passenger business, and it would apparently be quite as profitable to control ocean steamers and let them act as "tramps" carrying the products subservient to any one port to such of the world's markets as may be desired. If this were done there would not only be exports of pig iron, bar iron, steel billets, etc., from this district, but also of coal and coke.

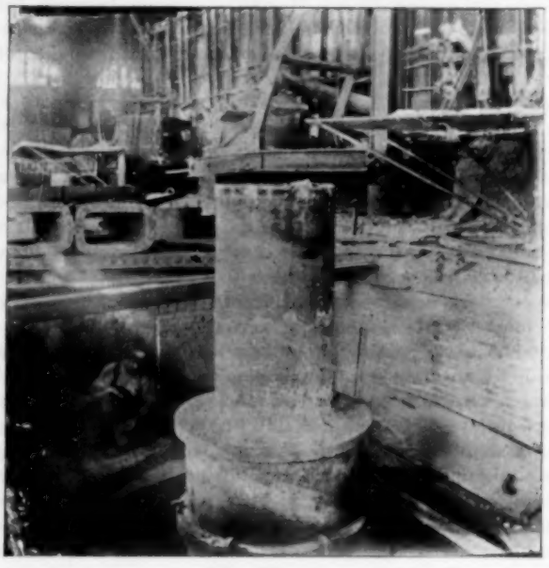
CASTING OF AN 8-INCH GUN IN ONE PIECE.

Reference was made in these columns a few weeks ago to the arrangements made by Dr. R. J. Gatling, of Hartford, Conn., inventor of the Gatling gun, for the casting of a one-piece steel gun at the Otis Steel Co.'s works in Cleveland. The last Congress made an appropriation of $40,000 to enable Dr. Gatling to have such a gun made and to bear the expense of testing it under the direction of the Ordnance Bureau. Dr. Gatling's claim is that a gun of high-grade steel, cast in one piece, will be not only less expensive than the built-up guns—the cost being estimated at about one-half that of either wire-wound or banded guns—but that his gun will have a longer life. Thirty shots is the limit of service of the average big gun of the type now in use.

The casting of Dr. Gatling's experimental gun, which, when finished, is to be 23 feet long and of 8-inch bore, was successfully accomplished at the Otis Steel Works, on Wednesday, Aug. 4. There were present beside Dr. Gatling, Col. J. C. Ayres, of Governor's Island, N. Y., recorder of the board of ordnance inspectors; Col. Peter G. Hawkins, of Baltimore, engineer member, and a representative of Capt. W. W. Gibson, who is stationed at Cleveland as inspector of gun carriage and other Government work under way in the city. The gun, which until it is bored is simply a huge tapering shaft, was cast muzzle end downward, in a pit over 30 feet in depth, in which a number of shafts (one of these latter weighing over 68,000 lbs.) and other heavy work turned out from this plant have been cast. The flask was made in 10 sections, those at the top being cylindrical and the mold was silica sand. Metal was drawn from two open-hearth furnaces. While its composition can not be given, it exceeded 50 points in carbon and an important component of the furnace charges was the well-known washed metal of the Youngstown Steel Co. The mold was fed from the bottom, the runner entering at an angle, so that the molten steel was given a swirling motion, the idea being that in this way the structure of the steel would be favorably affected and its strength increased. Fifteen minutes sufficed to complete the casting operation. Nine feet of the top of the mold is sinking head or "riser," and for this about 21,000 lbs. of metal was run into the mold from the top. Segregation, piping and blow-holes were thus effectually guarded against. The total weight of the casting is between 62,000 and 63,000 lbs. Of the 42,000 lbs. in the gun portion proper about 12,000 lbs. will be lost in boring and other finishing operations. The finished gun will have a diameter of 31 inches at the breech and 14 inches at the muzzle. The trunnions are 10 inches in diameter and their centers will be 183 inches from the muzzle. The location of the trunnions was determined by exactly balancing on a knife blade a miniature of the finished gun, modeled in wood.

The tensile strength of the steel composing the gun is expected to be about 100,000 lbs. to the square inch, with an elastic limit upwards of 50,000 lbs. to the square inch. The powder strain to be withstood is reckoned at 38,000 lbs.

About a week will elapse before the casting will be taken from the mold. The boring operation will be performed at the works of the Cleveland City Forge & Iron Co., whose lathes are the largest and most effective in Cleveland. Other machining will be done by the Kilby Mfg. Co. The casting will then be returned to the Otis Steel Works for annealing and for the forging of the interior by the use of apparatus especially designed by Dr. Gatling, employing a mandrel and expander. While under the powerful pressure thus exerted, the casting will be kept at a cherry red heat. For the final



operation of rifling the gun will be taken to the Washington Navy Yard.

Two attempts have been made previously to cast steel guns in a single piece. One of these guns was cast at the Hainsworth Steel Co.'s plant at Pittsburg, and the founder of the company, who died last year, had counted much on the results of the experiment. The operation of the casting was apparently successful, but the gun burst on the firing of the first shot. The metal would probably be classed as mild steel and too small a factor of safety was represented in the difference between the powder strains and its elastic limit. The other cast steel gun referred to was cast at Thurlow, Pa. It stood the tests so far as to remain intact, but after several shots the bore became enlarged and the gun was useless. Dr. Gatling, profiting by these preceding failures, expects to provide against their fatal defects.

We present herewith a reproduction of a photograph taken two days after the casting operation at the Otis Steel Works, last week. Two sections of the flask have been removed at the top, showing six or seven feet of the solidified sinking head. Since the photograph was taken, the gun has been taken out of the pit and the sinking head will be cut off preparatory to the removal of the huge casting to the Cleveland City Forge & Iron Co.'s works for boring.

At the Richmond mine near Palmer, Mich., work has been resumed and a sample shipment will be made to the Weston Furnace at Manistique. Further shipments will be made to Lake Erie ports. Ore from the stockpiles of the Lucy at Negaunee is also going forward to Manistique; but no mining is being done at this property.

CONDENSED FROM THE TECHNICAL PRESS.

Forms of Carbon and the Hardening of Steel.—[*Stahl und Eisen*, June 1.]—Prof. Ledebur gives the history of the researches made with reference to the forms of carbon met with in hardening steel and annealing hardened steel. References are given covering a period of time extending from the writings of Cardanus in 1557, to the more recent papers of our own savant, Prof. Henry M. Howe. Prof. Ledebur, in the logical and comprehensive train of thought for which he is so justly famous, begins with the first inklings investigators obtained in regard to a possible existence of various states of carbon in iron and steel. This was shown by the peculiar behavior of hardened and of annealed steel when subjected to chemical processes. The grand distinction of combined and graphitic carbon had long been known, but that combined carbon could exist in more than one form was a revelation. Treatment of the material with a solution of potassium bichromate in dilute sulphuric acid developed the fact that it was possible to separate out a compound of iron and carbon, a carbide of iron, from the main mass of iron containing the other form of carbon afterwards called the hardening carbon. This carbide of iron seemed to be more plentiful in annealed than in hardened steel, in fact sometimes only traces were found in the hardened bars. Being prominent in the old cement steel suggested its original name of cement carbon; the better and more current appellation, however, is "carbide" carbon. After considerable controversy the formula Fe_3C was finally settled upon this carbide of iron thus discovered, and it was noted that only after special means were devised to prevent oxidation while investigating, could this final result be attained. Prof. Osmond, of Paris, proved conclusively that it was this carbide carbon which gave the brown color to the nitric acid solution, and thus forms the basis of our colorimetric carbon determinations in steels. It is therefore of the utmost importance that the steel sample to be analyzed should have been treated exactly the same as the normal steel which is used for comparison.

It had been noticed before this that in slowly cooling a piece of red hot steel, an interruption in the continuity of the process takes place, which is accentuated by the fact that at this time an actual increase in temperature takes place so marked that it can be readily seen.

Conversely in heating a rod of steel the opposite holds true, though at a rather higher temperature, there being an absorption or rendering latent of heat. It was further found that this critical temperature was about 1300 degrees F., and any steel heated up to this point and immediately quenched, was properly hardened, while this could not be accomplished if the steel had not reached the above given temperature.

The theory necessarily developed was that in heating steel above the temperature for hardening, the carbide of iron, present in the annealed bar, as a net work disseminated throughout the mass, gradually dissolves in the bulk of iron, thus forming a uniform compound of iron and carbon. This process requires external heat which is thus made latent; moreover on quenching, this compound of iron and carbon remains as it was in the red hot bar, and the higher the original temperature above the quenching point the more of the compound is formed. This form of carbon has therefore been called "hardening" carbon, and is the only form of carbon contained in overheated iron. Gradual cooling sends the evenly diffused carbon back to the net work of carbide of iron above mentioned, and if great care is taken all the carbon is converted, thus leaving the bulk of the metal nearly free from carbon.

Now, while this carbide of iron is an exceedingly hard substance, yet in its form of a fine network disseminated throughout a large body of very soft material in the annealed steel, it is unable to affect the hardness of the bar as much as a moderate quantity of the other compound of carbon and iron would, being evenly distributed, in fact alloyed, in the mass of iron in a quenched state. This very simple and plausible theory has, however, required some further additions as a result of extended research. It seems that while the above holds true for steels running high in carbon, yet when it comes to the milder grades, or even wrought iron, there are found two or more interruptions in the cooling and heating processes. These differences in behavior are manifested in close connection with a variety of effects falling within the range of physical, chemical, and electrical methods of research, and the fact that even the irons poorest in carbon exhibit different properties when quenched from those they had originally, when under tensile strain, has led to the advancement of the theory of allotropic states of pure iron.

Here Prof. Ledebur and Prof. Howe begin to run apart; the latter holding that the above mentioned property of wrought iron is conclusive evidence of the allotropy of iron, while the former thinks that it is still an open question, believing that if such a state exists in iron, it should also hold true in copper, bronze, and other metals and alloys. The balance of the paper is given up to the discussion of the microscopical side of the question and will be taken up specially at some future time. M.

Carborundum versus Emery.—[*Dingler's Polytechnisches Journal*, July 9th.]—The discussion of this question is at present occupying the attention of the Continental press, and a few items thus brought out will be of interest to us here also. The impression seems to exist there that claims are made in America that carborundum has completely supplanted emery, and that the same thing is expected to hold true shortly in Europe. This is not the case by any means, and to the writer's knowledge there are many mechanical men who have made comparative tests, and as a consequence differ very materially on the relative value of both substances. The paper in question goes on to give Asia Minor and the Greek island of Naxos as the principle sources of the supply of emery. It is to be noted that emery is a variety of corundum containing magnetite as an admixture. In emery the abrasive material is a crystallized aluminum oxide; in the case of carborundum it is a carbide of silicon. While carborundum is much harder, yet its crystalline structure is not as favorable to a grinding process as that of emery. This is shown by the appearance of the individual crystals, those of carborundum being long and narrow, with few cutting edges and dead smooth faces. Emery, on the contrary, comes in crystals very nearly like the cube, and has rough surfaces. It would seem that the greater hardness of the carborundum is counterbalanced by the better cutting properties of the emery. This is also shown by the difficulty in keeping carborundum wheels from glazing when too much slag is used in making them. The conclusion reached in the paper in question is that emery has the advantage over carborundum for grinding or polishing purposes in all cases except where the finest grades are used. Here carborundum seems to answer best.

M.

Basic-Bessemer Slags in the Electric Furnace.—[*Zeitschrift für Electrochemie*, June 20.]—Dr. Borchers, the well-known specialist in electro-chemistry, in the course of a review of a new process for obtaining phosphorus in connection with calcium carbide, adds a few interesting observations in regard to his experience with basic Bessemer slags, which, by the way, are called Thomas slags on the other side. The process in question is a variation of the usual method of obtaining calcium carbide, for, instead of using lime, a tricalcium phosphate is taken for mixture with an excess of powdered carbon. This mixture on being heated in the electric furnace is converted to calcium carbide, phosphorus, and carbonic oxide. The phosphorus passes over into condensation chambers, where it solidifies in the water placed there for the purpose. The yield of phosphorus is said to be 80 per cent of the theoretical amount. Dr. Borchers' own observations relate to a series of experiments made with a view of converting the phosphates of these basic Bessemer slags into phosphides, in order to use these slags thus treated as a deoxidizing material for overblown iron. The results, however, proved negative, as the lime contained in the slag gave off its phosphorus, and went over into calcium carbide. The iron which was reduced from the oxides present took up some of this phosphorus, and the resulting product of the whole operation was calcium carbide, phosphorus, and a rich phosphide of iron. M.

THE Totten & Hogg Iron & Steel Foundry Co., of Pittsburg, manufacturer of rolling mill engines, rolling mills and tin plate mills, has just been awarded the contract for the machinery for the new four mill tin plate plant to be erected at Wheeling, by the La Belle Iron Works.

A 50-TON TRAVELING LADLE CRANE.

The 50-ton traveling ladle crane installed in the new basic steel plant of the Buhl Steel Co., Sharon, Pa., has several features that will make some details concerning it of interest to our readers. It was built by the Shaw Electric Crane Co., of Muskegon, Mich., which has supplied this type of crane to several steel companies, including the Illinois Steel Co., the Apollo Iron & Steel Co. and the Crescent Steel Co. A similar outfit was built for the Nicopol-Mariopol Mining & Metallurgical Co.'s plant at Mariopol, Russia.

In the illustrations Fig. 1 shows a general view of the crane. Fig. 2 shows the details of the main trolley, Fig. 3 a cross section through the crane, showing both of the trolleys in position, and Fig. 4 the auxiliary trolley. The main trolley, as will be seen from these illustrations, has a double-chain hoist, being mounted on top of the girder and equipped with two hoisting drums, one of which overhangs each side of the girder, so that the chains will clear in passing to the bottom block below. This trolley is of 50 tons capacity, while the auxiliary one, which runs between the girders beneath the main trolley, has a capacity of five tons. Both of the trolleys traverse the entire length of the bridge, the movement of neither being limited or affected by the other. The carriage of the main trolley is built up of steel and is operated by two motors, one for the hoisting and a second for the traverse. The gears are all cut, with the exception of the main drum, and all pinions are made of cast steel.

Both trolleys are equipped with the Shaw patent brake, the operation of which renders impossible the running down of a load any faster than a motor is revolved in the direction necessary for this operation. In addition to this, an electric brake is provided which is applied automatically immediately on the current to the hoisting drum being interrupted, whether by the operator or accidentally. On the crane an independent reversing electric motor is provided throughout for each movement. The auxiliary trolley has two of these motors, and one is provided for traversing the girder. One of the claims made for this crane is the easy access to all the operating parts. The crane is built with a factor of safety of not less than five when it is working to its full load; and on such parts as are subjected to wear, this factor is increased. The motors are of slow speed, requiring few reductions in gearing. These motors are of special design, and are very compact, all sizes above five h. p. being of the multi-polar type. The frames are of soft steel castings, and all sizes are made in a single piece. It is stated that between 300 and 400 of these motors are in operation in crane service, and not a single failure has ever been reported. The controllers are also manufactured by the builders. No combustible material is used, only mica and slate being employed for insulation.

All sheaves throughout are fitted with loose bronze bushings. The bridge and also the trolley truck wheels are made of charcoal iron, and have the treads chilled and ground. The operating platform of the machine, as can be seen from the illustration, is suspended beneath the girder near one end, and all movements are controlled by means of levers, a separate lever being provided for each movement. The movements are entirely independent, and the speed of one is in no way controlled or affected by that of another.

The main trolley of this crane is used for hoisting ladles of molten metal, while the auxiliary is used for tilting the ladle in removing cinder, and for any light work such as the handling of ingot molds, flasks, and like service about the cast-house.

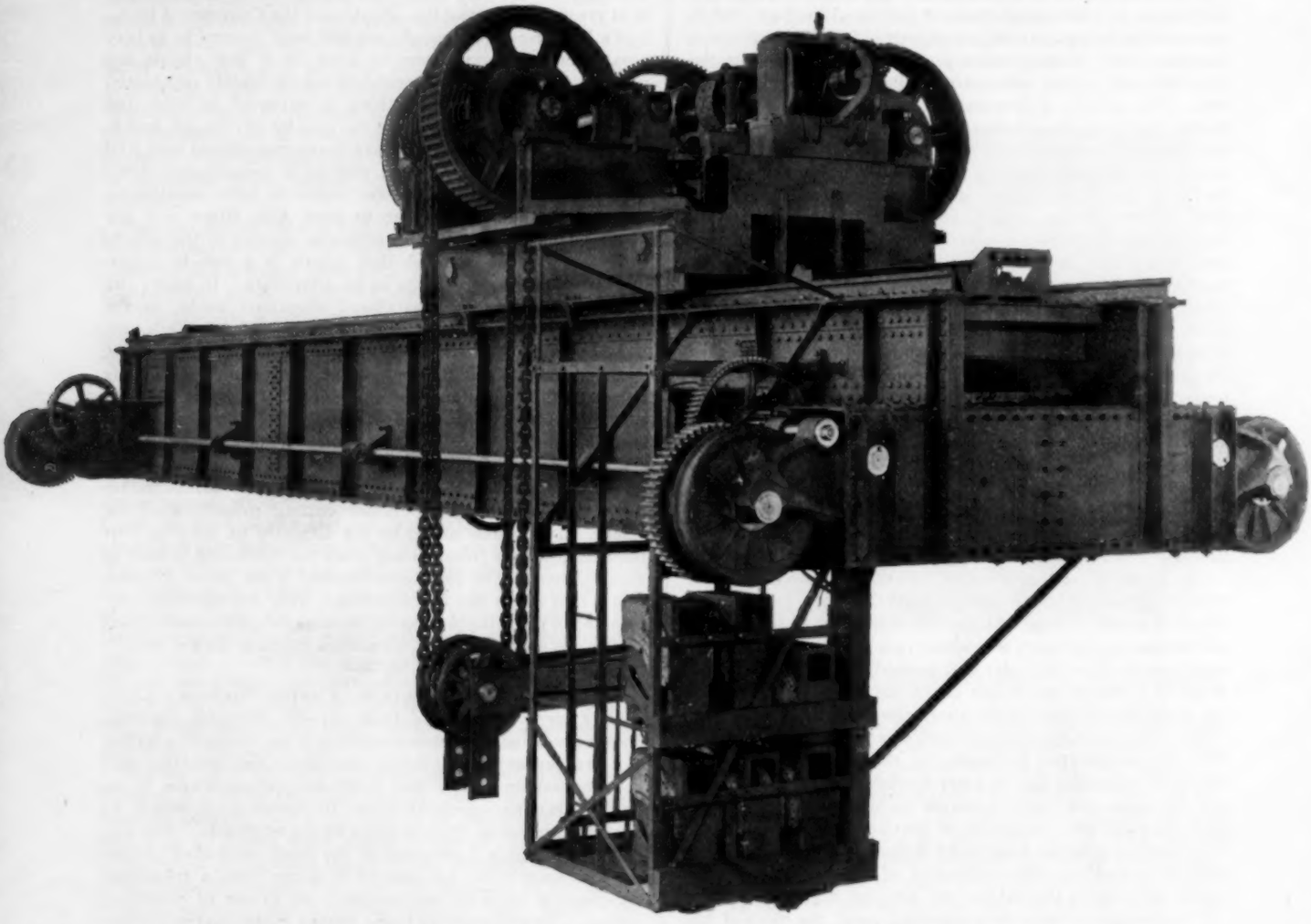


FIG. 1.—FIFTY-TON ELECTRIC TRAVELING CRANE (GENERAL VIEW).

THE American Pig Iron Storage Warrant Co. had 232,500 tons of pig iron in yard July 31, the previous 11 days showing 4,500 tons put in yard and 2,300 tons withdrawn.

THE old sheet mill of the Sharon Iron Works, at Sharon, Pa., resumed operations Monday. It has been idle over a year.

USES OF OPEN HEARTH AND BESSEMER STEEL.

The Institution of Mechanical Engineers, one of the leading technical associations of Great Britain, held its jubilee meeting, in celebration of the fiftieth anniversary of its founding, at Birmingham, Eng., beginning Tuesday, July 27. The address of the president, Mr. E. Windsor Richards, contained a number of interesting statements as to the growth of steel production, in the lifetime of the organization. We present a condensation of so much of the address as relates to this question.

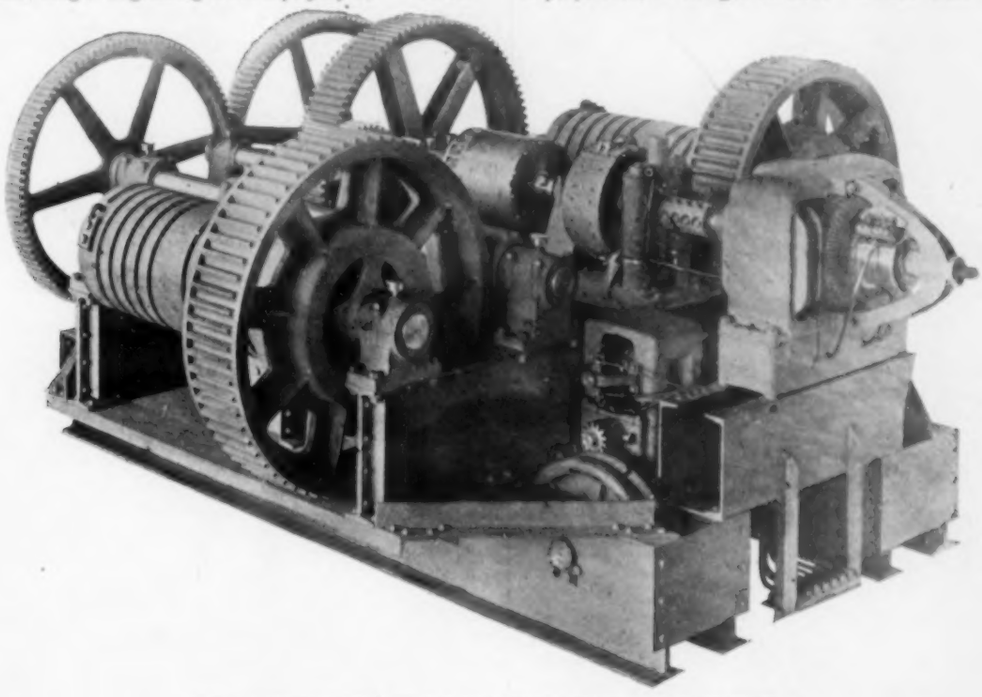


FIG. 2.—FIFTY-TON ELECTRIC TRAVELING CRANE—MAIN TROLLEY.

During the presidency of Sir Joseph Whitworth in 1856-57, Henry Bessemer's discovery was announced, by which it was claimed that by blowing cold air into and through molten metal, malleable iron and steel could be produced without fuel. The production of Bessemer steel has now attained to a yearly quantity of nearly 2,000,000 tons of ingots in Great Britain, and of 5,000,000 tons in America. Sir Henry Bessemer is now in his 84th year, and he might be justly proud that by his invention, conceived and matured during the reign of her majesty, the world was producing about 10,500,000 tons of Bessemer steel annually. Sir William Siemens, president 1872-73, and whose name was associated with that of his brother Frederick as inventors of the regenerative system for melting iron and steel, read a paper in Birmingham in July, 1862, on the gas furnace. At the time of his presidency of this institution, 25 years ago, the production of Siemens-Martin steel was 40,000 tons for the whole of 1872, and the price of ship plates about £17 per ton; while last year the production in Great Britain had reached nearly 2,354,000 tons, the price of ship plates being brought down to £5 5s. to £5 10s per ton. The total production of open-hearth steel in all countries in 1896 was nearly 7,000,000 tons.

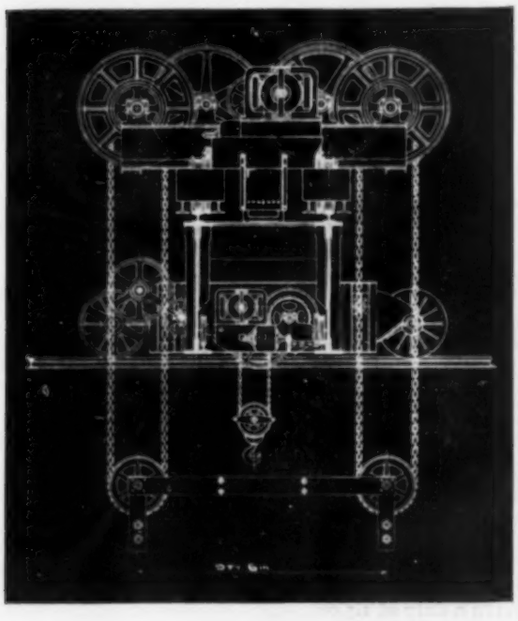


FIG. 3.—CROSS SECTION. FIFTY-TON ELECTRIC TRAVELING CRANE.

In 1879, the quantity of ship plates made by this process in Great Britain was 20,000 tons, as compared with 9,000 tons made by the Bessemer process, and it was at that time predicted that open-hearth steel would take possession of the field for ship and boiler plates, while the Bessemer process would supply the great bulk of the material required for railway purposes. It would appear as if this prophecy would soon be realized, for in 1896 the production of plates and angles by the Siemens process was about 1,000,000 tons, and by the Bessemer process about 60,000 tons; while by Bessemer about 1,000,000 tons of rails were made and by the Siemens 40,000 tons. Sir Frederick Bramwell, who was president in 1874-75, in his address at the Cardiff meeting strongly directed attention to what he correctly termed the cruelly and wickedly wasteful manner the country was rapidly using up the principal source of its wealth and power namely, coal. At that time 120,000,000 of tons were being raised in the United Kingdom, but to-day this is nearly 200,000,000.

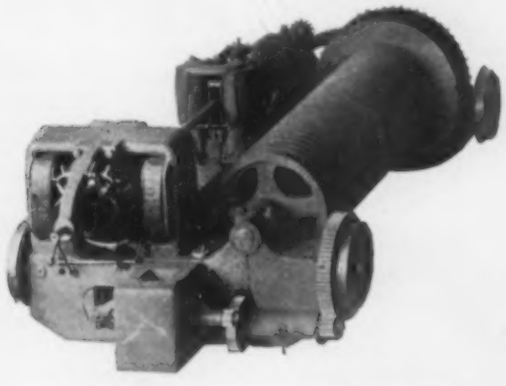


FIG. 4.—AUXILIARY TROLLEY.

DEVELOPMENT OF LAKE SUPERIOR IRON ORES.*

BY. D. H. BACON.

Nearly all men are too busy with their own affairs to keep informed of the progress in other lines. From time to time we read statistics showing the development in some industry, that cause us great astonishment, but the feeling of surprise soon fades, to be followed by others that likewise pass away. A short resume of what has been done in one line may be of interest.

During the late fifties the ore product of Lake Superior was handled over a mule tram road to Marquette. Now the Duluth, South Shore & Atlantic, the Chicago & Northwestern, the Wisconsin Central, the Duluth, Superior & Western, the Duluth, Missabe & Northern, the Duluth & Iron Range and the Lake Superior & Ishpeming railroads serve the shippers. Up to nearly 1870, a 700-ton ship was an enormous craft, the loading of which required two days, the unloading being seldom accomplished in that time. Now the cargoes reach 5,000 tons, the loading requiring less than three hours, and the unloading ten hours. In 1871 the largest ore barge carried 1,050 tons and made 12 trips per season. Now the mines cover more land than was familiar to even the timber cruiser when the Jackson mine was opened. The annual shipments have grown from a few thousands to 10,000,000 tons, and the ability of the mines to produce is not taxed. Lake freights are one-eighth of early prices, and rail freights one-quarter.

The deeper water ways, commodious locks and large ships of to-day are in a greater measure due to the movement of ore than to any other cause. Great savings have been made in each detail of each department. The only cost that has not been lessened, I am glad to say, is the cost for money paid to men; for wages, measured by what they will buy, are as high now as at any time past, except it were one of feverish activity.

As illustrating the cheapening that has been effected, ore is to-day sold at Lake Erie ports at for 1 per ton less than in early times it actually cost to mine, and this is done without loss. And further economies may be expected. Young men remember sales of ore in Pittsburg at $18 per ton, or about the present price of rails.

The first mines were opened in Marquette County, and were of what is commonly known as "hard ore." Previous to 1873 soft ore, or "hematite," was not popular, but the buyer was often obliged to take some in order to secure the needed quantity of hard ore. In those good old days the ore buyers came to the sellers as penitents approach the shrine, but I am told that custom in this respect has changed somewhat of late.

Beginning with a few grades, the Lake Superior mines now offer ores from the purest and best to those that will not bear transportation; and within these limits can be found the varieties needed for general or special products, and in quantity equal to any demand. The men who were early in charge of the mines had some knowledge of mining and quarrying. Many of their methods are now out of date, but experience, daily observation and study, technical schools, and the mechanical ability so common with Americans, have enabled those in charge to meet all difficulties and to carry the industry to a point that is complimented by visitors from abroad. In the discovery of new fields the miner of iron ore, like the miner of more precious metals, has led the way, the explanation of the geology being left to the student. As viewed from this distance the early methods were very crude. Horses furnished the power and they were worked in all possible, and some almost impossible, places. The little machinery then in use was poor and often but ill adapted to the work. The first hoisting plant of large size, economical design and equal to future demands was set up at the Lake Superior mine in 1880. Now single, compound, triple and condensing engines of large power are found throughout the iron ranges for hoisting, pumping and compressing. The hammer has been supplanted by the power drill, and electric motors and rope haulage are common above and below ground. Underhand, back and breast stoping, square sets, caving sets, saddle backs and milling and filling are common. Steam shovels and locomotives have taken the place of shovels and carts. Every known system has been or is in use. Many mines have presented difficulties that in the early days would have been considered insurmountable, but each has been overcome.

To one closely identified with this industry for nearly 30 years, no single change has seemed important, and only by looking backward can one measure the advance. The early operators had little knowledge of ore deposits, their position in relation to associate rocks, their dip, pitch, strike, depth and many other facts, an understanding of which is necessary to continued success. This knowledge has been acquired, and with it have come right, courage, true economy instead of parsimony, the general development of ore supplies far beyond immediate needs and a thoughtful preparation for the future.

Nitro-glycerine and power drills have done more to reduce cost than any other two changes. In 1871 a drift was driven at the Cleveland mine at a cost of $100 per foot. Now the cost would not exceed $16. In one case men were harnessed to a derrick sweep. Heavy rains were nearly always followed by a few days of idleness, and the pumps were expected to freeze every cold night.

In speaking of mining methods, the "caving system" was mentioned, which several claim to have invented or introduced. The first ore taken out by this method was mined at the Cleveland Hematite in 1883. The ore was very soft, with treacherous walls, and Mr. G. W. Wallace, the superintendent, tried what some of his men said was successful under like conditions in England. It proved satisfactory and is now known as the "caving system." Mr. John Pengilly was sent to the Cleveland Hematite to learn the method so that he might use it at the Brotherton mine.

While to the miner the quantity and quality, and not the origin, have been important, he has still acquired a thorough knowledge of local geology.

A look at the past may tickle our vanity; but our interests are in the future. Can we maintain present output? Can we increase it? For how many years can buyers depend upon Lake Superior for their supply? The discovery and quick development of the Mesabi profoundly affected the iron and steel industry of this country in every branch, and the effect may extend beyond our shores. The opening of the Mesabi does not mean idleness on other ranges, but does mean for them greater economies and smaller profits. The new range competes with itself as well as with others. But each era of depression brings a reward in the better methods that are forced upon us and which continued into days of prosperity increase the volume of business and to that extent the profits. With the low prices that are here to remain, it is more than ever difficult to estimate the annual consumption. Speaking of the several ranges as one, the acreage of known ore is but a small part of the area that may contain ore. Discoveries are still being made in the Marquette district, the exhaustion of which was expected 20 years ago. And I may say in passing, that the known ore under the bed of Lake Angeline is four times as great as was all the known ore in all the mines of that county at any time prior to 1887. The past few years have not been such as encourage prospecting; but given favorable conditions, we may confidently depend upon important discoveries. For 40 years this region has met all demands and its resources are to-day, as compared with the demand, greater than at any time past, and I believe that those who are now active will have stepped aside and perhaps been forgotten before this region will fail to meet all demands.

Is it not your opinion that with wise legislation this people can build and maintain a merchant marine that will carry the products of our farms and mills to distant ports, advertising to the world that we have taken the position among nations to which by resources and energy we are entitled?

* Read before the American Institute of Mining Engineers, Lake Superior meeting, Tower, Minn., July, 1897.

WITH a duty of 1.5 cents a pound on tin plate, the Pacific coast market may be considered wholly ours, barring drawback plates, which constitute only a moderate part of the consumption there. The increased duty is likely also to still further reduce the quantity of imported ternes and charcoals. We do not look for any advance in price of American plates to consumers. Nothing can arrest the gradually declining prices due to the introduction of labor saving machinery and improved processes. It may be set down as an axiom in the tin plate trade that the makers improve their processes and machinery, not for their own good, but for the benefit of their customers.—[Tin and Terne.

SOUTHERN IRON DEVELOPMENT.

T. G. Bush, president of the Clifton Iron Co., Ironton, Ala., and of the Shelby Iron Co., Shelby, Ala., delivered an address recently on "The South and Its Resources," before the Commercial Club of St. Louis. We make some extracts from the portions relating to the development of the iron industry of the Southern States:

The growth of the manufacture of iron and the production of coal in the South, is of comparatively recent date, but none the less interesting and striking.

In 1867, Hon. Abram S. Hewitt, of New York, one of the most distinguished, intelligent and thoughtful men of our country, after investigating the resources of the South, and Alabama particularly, for the manufacture of iron and the production of coal, prophesied that what is known as the "Birmingham District" would be the center of the iron industry of the world. Iron manufacturers of the North and West, however, received this prophecy with incredulity, claiming that the coal of the South, and Alabama particularly, would not make commercial coke, suitable for manufacturing standard iron. But what do we see as to developments in this line within a comparatively short time? In 1880 the South made 397,301 tons of pig iron, and in 1895 the output was over 1,700,000 tons. In this connection I desire to state that in 1896, out of a total production of more than 1,700,000 tons of iron in the South, Alabama produced more than 850,000 tons. Just here I would like to digress for a moment, in order to call special attention to the growth and present condition of the iron and coal industry in Alabama, because of the fact that in what is known as the "Birmingham District," iron is being made cheaper than in any other place in the world.

The first pig iron of any consequence produced in Alabama was in 1872, in which year the total production for the State was 11,171 tons. The production in 1880 was 68,925 tons; in 1885, 203,069 tons; in 1890, 816,911 tons; in 1895, not including charcoal iron, 854,667 tons. The most interesting feature connected with this business, has been the marked reduction in the cost, so that at this time Alabama furnaces are able to compete with manufacturers of England in their own and other countries. As an evidence of this, I call attention to the fact that within the past ten months Alabama manufacturers have exported more than 150,000 tons of coke iron to various countries of the world, including England, Italy, Germany Austria, Holland, Japan, Canada, Belgium, Mexico, India, etc.

The production of coal in Alabama for the year 1870 was 10,999 tons—less than what is produced at this time in one single day at the Pratt and Blocton mines, operated by the Tennessee Coal, Iron & Railroad Co. In 1875 the total production of coal in the State was 67,200 tons; in 1880, 380,000 tons; in 1885, 2,492,000 tons; in 1890, 4,090,409 tons; in 1896, 5,745,617 tons. The output of coal in the Southern States in 1895 was 33,198,693 tons, including West Virginia — Alabama producing, as will be seen, more than one-sixth. The total production of the United States was about 180,000,000 tons, the South producing about 15 per cent.

Alabama to-day stands fourth as an iron-producing State in this country—the product of Illinois (which is third) for 1896 exceeding that of Alabama about 3,000 tons. Alabama is the third State in the production of iron ore. One of the most notable features in connection with the manufacture of iron in Alabama, is the juxtaposition of the material entering into its manufacture, and the apparently inexhaustible supply of same. The average distance which iron ore is hauled to the furnaces in Birmingham district is about 15 miles, coke about 5½ miles, and limestone about 20 miles. The great vein of red ore in Red Mountain, near Birmingham, runs for a distance of about thirty miles.

As to the supply of coal, the measures of the Warrior Coal Field comprise 7,810 square miles, over 3,000 feet thick, with about 50 seams of coal. These seams range in thickness from a few inches to 12 or 14 feet, and at least 35 of them with a total thickness of about 90 feet of workable veins. Estimating, however, that the workable area of this coal is only 500 square miles, seventy-five feet in thickness, we would have a block of coal 75 miles long by 50 miles wide and 10 feet thick, or say 37,500,000,000 tons—enough to last about 10,275 years at the rate of 10,000 tons per day.

In the Cahaba coal field the total area is 400 square miles, and the measures said to be some 5,000 feet thick; is reported to have 10 or 12 seams of coal of a thickness of 2½ feet and over, with a total thickness of 40 to 50 feet. Estimating that the available coal in the seams will cover 200 square miles of 20 feet depth, we will have 4,000,000,000 tons of coal, which would last about 1,100 years at the rate of 10,000 tons per day.

In the Coosa coal field the area is 345 square miles, the estimated quantity of coal 600,000,000 tons, or enough to last 65 years at the rate of 10,000 tons per day. Indeed, beneath the soil in the South, and especially in Alabama, is to be found all the riches that the mineral world almost knows. In addition to iron and coal, we have gold, copper, mica, phosphates, etc. It is doubtless known to you that most extensive deposits of superior quality of phosphate have recently been discovered in Tennessee, near Columbia, that is so near the surface and mined so cheaply as to be put on the cars, kiln dried, at a cost of but little more than $1 per ton.

Birmingham and Anniston are the two most conspicuous industrial centers in the State at this time—Birmingham being located in what is known as "the red ore district," and Anniston in "the brown ore district." The rapid development of these two centers can be understood better by the rapid growth and investments in manufacturing enterprises. In 1880 the population of Birmingham was 3,086; in 1897, including immediate suburbs, 66,000. There has been invested in that vicinity in manufacturing enterprises $34,668,250.

Anniston was opened to the public in the summer of 1883, and now has a population, including its immediate suburbs, of 15,000 people, with an investment of about $8,000,000 in manufacturing establishments.

In view of these figures, and considering that the iron ore, and coals fields of Alabama are nearer to tide-water than any other similar sources of supply in this country, who can estimate the future growth of its iron and coal industries, and the effect they will have on the manufacturing and commercial interests of the world?

It is worthy of note in this connection that at this time a good deal of the pig iron made in Alabama is being consumed by stove factories, foundries, and more particularly by manufacturers of iron pipe—the largest individual pipe works plant in the world being located at Bessemer, Ala., 12 miles south of Birmingham, and another almost as large at Anniston. The four pipe works plants in Bessemer, Anniston, Chattanooga, Tenn., and South Pittsburg, Tenn., melt about 150,000 tons of iron per annum.

Sixty Years' Progress in Marine Engines.

A correspondent of the London *Times* summarizes, in connection with the naval review of the Queen's Jubilee celebration, the progress of the marine engine in the past 60 years. He says it embraces an increase of steam pressures from three to 155 pounds per square inch, excluding from the account the water-tube boilers; an increase of piston speeds from 220 to nearly 1,000 feet a minute; a decrease in the weight of marine engines in proportion to the power they develop from 10 hundredweight to 1¾ hundredweight per indicated horse-power, more than five times the power for a given weight of machinery; and a decrease in the fuel consumption proportioned to the power from five to seven pounds per indicated horse-power per hour to two pounds. The correspondent explains that "these figures do not represent the best that has been done in regard to modern ships, but they may be taken as fair on the basis of comparison here adopted."

Enlarged Buying by Railroads.

The public cannot complain at any dilatoriness on the part of the railroads in hastening the return of prosperity, for they seem to be putting every cent of additional income into circulation as soon as they get hold of it. Reports of increase of work in shops, and improvements requiring the employment of men and the purchase of material, are published almost as soon as the news of increased traffic, and sometimes sooner. Most of these published statements are general in character, giving no names of companies or of places, but we note that the Burlington is running all its shops 10 hours a day; that the Boston & Albany has increased working hours; that the Great Northern has employed 200 additional mechanics at St.

Paul and that the Canadian Pacific shops at Winnipeg are rushed with work. All of the roads in the grain States are finding use for all their freight cars; and the state of the export grain market indicates that the activity will not be temporary.—[Railroad Gazette.

How Our Trade Conquests Hurt In England.

A London cablegram of recent date gives the following, indicating that American incursions into British markets are beginning to hurt:

"Lord George Hamilton, Secretary of State for India, replying in Commons to-day to a question why the East India Railway, owned by the government, has bought 7,708 tons of rails from the Maryland Steel Co., said that the lowest British bid was £8,675 ($43,375) higher than the American tender.

"An evening newspaper notes that English firms are indignant that the contracts for the traction plant of the London Central Railway, which is to be an underground electric line, amounting in value to hundreds of thousands of pounds, have been given to Americans. The secretary of the company explains that the contracts for carriages, locomotives and machinery were given to American firms on the advice of electrical experts, who represent that the greater use of electrical traction in the United States has brought its manufacture to a higher degree of perfection and made it far less expensive than in England."

A writer in the *Ironmonger* says "I understand the East Indian order for 7,600 tons of rails, taken some time ago by the Maryland Steel Co., United States, has now increased by 1,250 tons. This is of peculiar interest to British rail makers, seeing that the specifications are so rigid that there was a general impression that the American houses would not be able to comply with them. It is stated that about 70,000 tons of American rails will be exported this year, 40,000 tons going to Japan, where the rails are said to be liked better than the English rails."

New Process for Seamless Tubes.

An improvement in the manufacture of seamless metallic tubes has recently been patented by two Midland (Eng.), engineers. Three shafts are provided, which rotate by means of appropriate gearing. Upon each of these shafts is secured a series of rolls having their edges convex. These rolls diminish in size from one end of each shaft, which can be called the leaving end, the rolls at that end being the largest. The series of rolls on each shaft diminishes in size in a similar manner, so that the three largest rolls—that is, one on each shaft —are in one plane as the leaving end, then the three next largest in plane parallel to the first, and so on. The effect of placing the rolls on the shafts in this manner is that between the smallest rolls there is a central aperture which is large enough to receive, or very nearly to receive, the short thick tube when presented to it endwise. The tube, being forced, is seized by the next set of rolls, and a reduction of external diameter with an increase of length is the consequence. From these rolls it passes to the third set of rolls, and so on, until it emerges from between the largest set of rolls at the extremity of the machine.

The Proposed Federal Armor Plate Plant.

The Cramp & Sons Co. has told the Navy Department that it will undertake to supply the small amount of diagonal armor, about 80 tons for each of the three war vessels now under way at the maximum price of $300 allowed by Congress. The shipbuilding companies have declined to submit proposals for supplying the other armor needed for the three vessels. The special commission provided for by act of Congress to investigate the cost of establishing a Government armor plate plant met this week in the Ordnance Bureau, Washington, for organization and for mapping out the work. The difficulty in getting exact data as to many of the details that must be inquired into may prolong the work quite to the opening of the regular session of Congress. The proposed establishment of a Government steel plant for the production of ingots is to be one of the features of the inquiry.

In view of the starting up of the new basic steel plant at Birmingham, Ala., that city is asserting its claims to consideration as a fit location for the Government armor plate plant, should one be erected.

Received from the Trade.

Attractive as a piece of catalogue-making, the latest publication of Henry R. Worthington is particularly interesting in its subject matter. Supplementing the literature of this concern's condensers, it brings together in one catalogue illustrations and descriptions of the three types—the jet condenser, the surface condenser and the self-cooling condenser, of which the last named had special treatment in a catalogue issued, some time ago. The twin-cylinder vertical condenser has particular attention in the booklet before us. It represents the latest advance in this class of apparatus and is designed to fill the demand for an air pump and condenser to occupy the least possible floor space and still have all its internal parts easily accessible.

Recent circulars of the I. W. Bollinger Co., the Rookery, Chicago, announce that the company is sales agent for the McCool Tube Co., Beaver Falls, Pa.; Wm. Clark Sons Co., Pittsburg, and the Champion Rivet Co., Cleveland. The specialty of the last named company is Victor rivets, low in phosphorus and low in sulphur.

It is announced that a contract has been signed for the shipment of 1,000 tons of aluminum to the English market by the Pittsburg Reduction Co. The order was placed in open competition with all the aluminum works of Europe. The metal is sold to British metal dealers who will in turn re-sell it to the sole manufacturers of aluminum articles in Great Britain. The total American output of aluminum for 1896 was about 1,300,000 pounds, and it is estimated that the production for 1897 will reach 2,000 tons, of which, it is expected, 1,000 tons will be consumed in the United States. The delivery of the English order will cover a period of four years, which will leave a surplus of American aluminum for export to other countries.

By reason of the recent excessive rains, much inconvenience has been caused in the construction of the Pittsburg Bessemer & Lake Erie Railway At Turtle Creek, 12 miles east of Pittsburg, owing to the soaked condition of the ground, grades have weakened and landslides have occurred. Driving of spiles has been made necessary at several points. It is feared the completion of the road will be delayed beyond Sept. 1, the time specified.

The Bureau of American Republics has received information that merchants of Rio de Janeiro have chartered two vessels now at San Francisco, to convey cargoes of California wheat to Rio. This is the first time in history that such a thing has occurred, and is attributable to the short crop in the Argentine Republic and Uruguay.

Waste heat boilers of the Hyde type installed at the Vesuvius mill of Morehead Bros. & Co., Sharpsburg, Pa., supply steam sufficient to run the finishing department in which are three trains of rolls. The saving is evidenced by the displacement of a battery of four boilers, for which it would take at least 500 bushels of slack for a double turn, six men being required to fire the boilers, unload the cars, and remove the ashes.

Hyde Bros. & Co., Pittsburg, have put four of their boilers in the puddle mill of the Falcon Iron & Nail Co., at Niles, O., to utilize the heat from eight puddling furnaces. The boilers will supply steam for the engines driving the cold rolling mill.

The striking puddlers at the National Tube Works, who for the last 14 weeks have been standing out against the $4 puddling rate, have notified the company of their willingness to accept the $4 rate as agreed upon by the Amalgamated Association, at Youngstown. Resumption of operations is announced this week.

The analysis of the basic open-hearth steel made in the first three runs at the Birmingham Rolling Mill Co.'s new plant at Birmingham, Ala., is as follows: 1—Sulphur, 0.024; phosphorus, 0.01; carbon, 0.11; manganese, 0.41. 2—Sulphur, 0.025; phosphorus, 0.02; carbon, 0.10; manganese, 0.39. 3—Sulphur, 0.027; phosphorus, 0.029; carbon, 0.13; manganese, 0.42.

Because our Fathers and our Forefathers did—

Just because it has been the proper thing in the past to use a closed feed-water heater in rolling mills, blast furnaces and other large plants—it is no reason why we should take our bricks up in a hod on our back, when an endless chain worked by steam will do it for us at a smaller cost—or that we should burn tallow dips if we can obtain a better effect by turning or pressing a button—and similarly, some concerns in the iron and other industries are coming closer to present day practice by trying—just trying—**COCHRANE FEED-WATER HEATERS.**

From our lists of those who are "trying" these appliances we present the following names:

Ohio Steel Co.; Shoenberger Steel Co.; Oliver Wire Co.; Oliver I. & S. Co.; Reeves I. Co.; Clinton I. & S. Co.; Monongahela Furnaces; Weston Furnaces; Consolidated Wire & S. Co.; Firth-Sterling S. Co.; National Foundry & Pipe Co.; National Tube Works; Phosphor-Bronze Smelting Co.; Sterling Iron & Railway Co.; National Galvanizing Works; Sharon Iron Co.; Oliver-Snyder Steel Co.

Yours for hot feed-water—real purification and **OPEN HEATERS,**

HARRISON SAFETY BOILER WORKS, Mfrs., Phila., Pa.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

Machine tools.—George H. Hall, Cartersville, Ga., wants to buy a screw-cutting lathe, 8 to 16-inch swing and six-foot head.

Bids are asked until Aug. 19, for 20 sets of American steel forgings for the manufacture of mortars. Gen. D. W. Flagler, Ordnance Office, Washington, D. C., will receive them.

Efforts are being made to locate a sheet mill, at Scottdale, Pa., to be run on the co-operative plan by striking mill workers of the Scottdale Iron & Steel Co., at Scottdale. Burgess W. N. Porter, Charles Graft, and T. J. Tannehill, of Scottdale, comprising a committee, have already $50,000 subscribed by the union men, but more than double that amount is needed.

New Construction:—

Work has been started on the plant of the Vulcan Foundry Co., of Pawtucket, R. I., of which Darius L. Goff is president and Gardner C. Sims is treasurer. The works will consist of a main foundry, 100x60 feet, a 50x60 pattern house and office.

The Reading Car Wheel Co., at Depew, N. Y., is building a new car wheel foundry.

At Franklinton, N. C., the Stirling Cotton Mills Co. is erecting a repair shop for the plant, and is in the market for machinery.

At Baltimore, a new foundry has been put in operation at the works of the Baltimore Malleable Iron & Steel Casting Co., of which Patrick Kennedy is the proprietor. The new foundry was made necessary by the growth of the business, and is the third building to be erected within the past five years. The plant now represents an outlay of over $150,000, and has a capacity of casting about 100,000 pounds a day. Two melting furnaces and a 30,000-pound electric traveling crane are used in operating the works. The new foundry is built of brick and iron, with slate roof. It is 80x200 feet. Power is furnished by a 60-h. p. gasoline engine. Malleable, gray iron and steel castings are produced.

Ground has been donated for a new machine shop at Toronto, O. Building will be put up at once.

The Shiffler Bridge Co., 45 Broadway, New York City, has secured the contract for the new iron buildings for the Poughkeepsie Glass Works, Poughkeepsie, N. Y., consisting of a furnace building, 120x200 feet, a shop building 183x39 feet, and a machine shop 39x42 feet.

Bids will be opened Aug. 18 for the superstructure of the bridge over the Mahoning river, Youngstown, O. The structure will be 1,850 feet long and 54 feet wide.

Geo. W. Knopf, Pittsburg, has secured a contract from the Newark (O.) Weldless Tube & Steel Co. to erect its new rolling mill plant, to be 90x160 feet in size, and to be constructed entirely of steel, the roof to be of slate. The buildings have been staked off and foundations about completed.

The McCormick Harvesting Machine Co., of Chicago, is reported to be planning the largest foundry in the west. It will have a capacity of 200 tons of castings per day. The greater part of the molding of this company has been done on machines and this practice will be continued.

The Newport News Shipbuilding & Dry Dock Co. is making extensive additions to its large plant at Newport News, Va. One of the large additions under way is the erection of an extension to the machine shop, which will be 100 feet wide and 200 feet long. This building will be used for the finishing and erecting of marine engines and other large machinery used in connection with the mammoth steel vessels which this company have under way. The central portion of the building will be 50 feet high and will be supplied with an electric traveling crane capable of lifting and carrying a load of 50 tons. On either side of this central space will be located a gallery arranged for small machines and fitting tools. The building is to have a steel framework throughout, and the roof is to be covered with corrugated iron. The Berlin Iron Bridge Co., of East Berlin, Conn., has the contract for furnishing and erecting the steel work of the building.

It is announced that the McMullin Woven Wire Fence Co., Chicago, Ill., will erect a plant at Evanston, Ill. Preparations are being made for the first building, which will be 111x50 feet. The machinery will be run by electric motors. D. S. McMullin, Chicago, is president.

The Thomas Brass & Iron Works, Waukegan, Ill., it is reported, will build a foundry in the coming year.

Additions, Enlargements, Removals, Etc.:—

Extensive additions are being made to the plant of the Burgess Steel & Iron Works, at Portsmouth, O. A new blooming mill and a 35-ton basic open-hearth furnace will be in operation in about five or six weeks. The company has had a satisfactory run of orders. The mill is quite busy, with work in some departments booked a month in advance.

Major Wills, of Nashville, and R. L. McKellar, of Memphis, have visited the rolling mill and spike factory at Roanoke, Va., and will report to the citizens of Sheffield, Ala., on the advisability of removing the plant to the latter city.

The Great Western File Works, at Beaver Falls, Pa., will probably be enlarged in the near future, as the plant is of insufficient capacity to take care of current business.

General Industrial Notes:—

Employes of Dilworth, Porter & Co., Pittsburg, have been notified of a ten per cent reduction in wages.

The annual meeting of the stockholders of the Pittsburg Forge & Iron Co. will be held Aug. 17. Election of directors and officers will take place.

A new trial has been refused in the case of the Pittsburg Iron & Steel Engineering Co., against the National Tube Works Co. The action was taken to recover a balance alleged to be due the plaintiffs for constructing a Bessemer steel plant at McKeesport. The plaintiffs recovered a verdict of $76,000.

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SEMI-STEEL Machinery Castings of All Kinds.

Cylinders, Rolls, Dies, Etc.

10,000 LBS. TENSILE STRENGTH.

Castings Furnished Within Two Days After Receiving Patterns.

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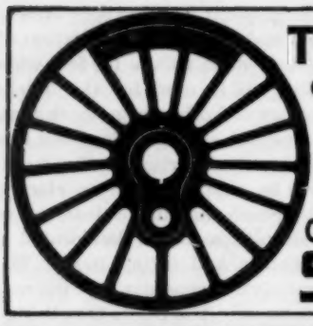

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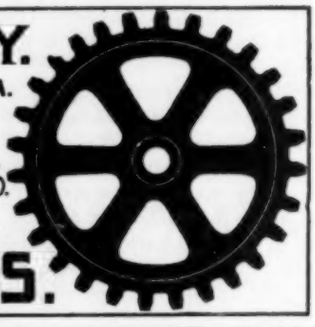

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Flange Plates, Ship Plates, Tank Plates, Steel Car Axles and Forgings of all kinds.

Steel Castings from 100 to 75,000 lbs.

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ST. LOUIS, 516 N. Third St. WASHINGTON, Kellogg Bldg.
MONTREAL, J. G. Sibbald, 3 Windsor Hotel.
SAN FRANCISCO, John Woodlock, 26 Beale St.

Recent locomotive orders include 31 for the Illinois Central, placed with the Brooks Locomotive Works; six from the C. M. & St. P., placed with the Baldwin Works; 10 for the Chicago & Northwestern, placed with the Schenectady Locomotive Works. The Illinois Central is asking bids on 200 box cars. The Missouri Pacific has placed 500 box cars with the Missouri Car & Fdy. Co.; the Georgia Railway 250 box cars with the Mt. Vernon Car Mfg. Co.; the Mobile, Jackson & Kansas City, 100 flat cars with the Ohio Falls Car Mfg. Co.; the Chicago, Rock Island & Pacific, 200 box cars, with the Michigan-Peninsular Car Co.

On a recent contract for 600 tons of cast iron pipe for Norwalk, O., the Lake Shore Foundry Co., Cleveland, bid $16 on 4-inch and 6-inch pipe; the Howard-Harrison Iron Co., $17 and $16; South Pittsburg Pipe Works, $14.89 on both; Anniston Pipe Co., $15.60; Shaw-Kendall Co., $14.75; Jas. B. Clow & Son, $16.10 and $15.10; the Addyston Pipe & Steel Co., $14.75. The Shaw-Kendall Co., whose bid, with 14 tons of special castings at $35 a ton, was $9,399, got the contract.

The Davis & Egan Machine Tool Co., Cincinnati, has purchased the extensive works formerly occupied by the W. S. Merrill Chemical Co., of Cincinnati. The buildings are modern and adapted to the operation of heavy machinery. They are 103 feet front, five floors, with basement and sub-cellars, having a railroad frontage on two streets. The new purchaser is making a complete installation of new engines, boilers, generators, dynamos, etc. The addition joins the present works of the Davis & Egan Co. It was necessitated by rapidly expanding foreign trade. In the past 12 months, the company reports, 25 per cent of the business was for export.

F. W. Horne, who is now on his way to Yokohama, Japan, has placed a large order for lathes, planers, shapers, milling machines, etc., with the Davis & Egan Machine Tool Co., of Cincinnati, O. He will represent that company in China and Japan.

The Wellman steel plant at Chester, Pa., will be sold under foreclosure proceedings on judgments of $320,934.19, entered last week.

The entire plant of the Lalance & Grosjean Mfg. Co., at Harrisburg, Pa., is in full operation and the prospects are encouraging for a steady run to the end of the year.

Spearman furnace of the Spearman Iron Co., at Sharpsville, Pa., is being prepared for blast.

The Troy Steel Co. has blown in a second blast furnace at Troy, N. Y.

The name of the Cincinnati (O.) Rolling Mill Co. will be changed to the Cincinnati Rolling Mill & Tin Plate Co. The sheet mills are being converted into tin mills. James Baird, late superintendent of the Ellwood Tin Plate Co., will superintend the plant.

U. BAIRD MACHINERY CO.

123 AND 125 WATER STREET, **PITTSBURG, PA.** 124 AND 126 FIRST AVENUE.

MACHINE TOOLS AND SUPPLIES.

Some SECOND-HAND TOOLS in stock.

1—8-ft. Boring Mill.
1—No. "D" Horizontal Boring & Drilling Machine.
1—Garvin Profiler.
1—A. T. & M. Co. Valve Milling Machine.
4—No. 11 Brown & Sharpe Milling Machines.
2—No. 1½ Stiles Presses.
1—No. 3 Stiles Press.
1—36-in. G. & E. Spur Gear Cutter.
2— Crank Planers.
3—No. 1 Brown & Sharpe Screw Machines.
2—No. 6 Brown & Sharpe Screw Machines.
1—36-in. Car-wheel Borer.
1—55-in. Pneumatic Riveter.
1—30-in. Pulley Lathe.
1—Pratt & Whitney Turret Lathe.
1—109 in. Engine Lathe.
1—15-in. Fox Turret Lathe.
1—20-in. Lodge-Davis Turret Lathe.
1—20-in. x 10-ft. Gleason Engine Lathe.
1—24-in. x 12-ft. Gleason Engine Lathe.
1—3-Spindle Drill Press.
2—30-in. Drill Presses.

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Steel Plants, Sheet and Tin Plants, Gas Furnaces and Producers Structural Iron and Steel.

Automatic Billet Heating Furnaces. **Plans and estimates furnished.**

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"THE IRON TRADE REVIEW"

is an increasingly valuable medium through which to sell equipment to machine shops and foundries.

At Muncie, Ind., the Midland Steel Co. has adjusted the steel scale with the Amalgamated Association, the tonnage basis proposed by the company, in view of its installation of labor saving equipment, being accepted. The Muncie Iron & Steel Co.'s plant has resumed and the Indiana Iron Co. starts this week. The Indiana Bridge Co. is running double turn.

Advices from Eastern interests handling Illinois Steel Co. stocks are that the company has reduced its bills payable including the $1,500,000 loan from $6,000,000 to $2,500,000 and that the company has about $1,200,000 bills receivable and cash on hand against $900,000 on Dec. 31, 1896. It owes no money except to the banks. The company is considered by the directors to be in a very satisfactory financial condition and to be in position to quickly feel the effect of any business improvement. The principal output of the company for some time has been steel rails.

The Reading Iron Co. started up its plant at Danville, Pa., Monday, the employes in all departments accepting the figures recently proposed by the company.

The Birmingham, Ala., rolling mills shut down pending the wage adjustment, started up Monday.

The Lackawanna Iron & Steel Co., of Scranton, Pa., has ordered shipments of ore from Cornwall to be resumed to Scranton at the rate of 600 tons per day. Pig iron is also being shipped to Scranton from the Colebrook and North Lebanon furnaces at Lebanon.

An ordinance will be introduced authorizing the turning over of the old Baltimore & Ohio rolling mill in Cumberland, Md., which has long been idle, from its present owner, the Baltimore & Ohio Railroad, to other parties, who will put it in operation. The property covers 33 acres, and the city in 1868 issued bonds for $30,000 to puchase the site, which was to be the property of the railroad company as long as a rolling mill was operated, but to revert to the city when discontinued. It is believed the agreement will be amended to permit the railroad company to negotiate for industries. The site is said to be worth $50,000.

The Illinois Iron & Bolt Co., Carpentersville, Ill., has increased its force to 300 hands, the full working capacity, and has ordered an increase of working hours to full time.

At Pittsburg, last week, the Shoenberger Steel Co. sued Posey & Sebolt for $15,000. The plaintiffs have been buying coal from Posey & Sebolt since May, 1896, and they accuse the defendants of making an overcharge on every bill rendered. The total alleged overcharges amount to over $13,000 and the plaintiffs seek damages in the sum of $15,000. It is asserted the defendants have made promises to refund the difference, but have failed to do so.

At Butler, Ind., the Auburn Foundry & Machine Works made an assignment to John W. Baxter and I. Hanna. The assets and liabilities are not known, but will be large.

The Columbiana Pump & Machine Co., at Columbiana, O., has had N. M. Fuhrman appointed receiver.

The Chester Pipe & Tube Co., of Chester, Pa., has started additional furnaces and will run double time.

The new Baltimore Tin Plate Co. started its plant at Locust Point, Md., last week. Some new equipment has been added and the product is now 246 boxes a day. When running full 300 men will be employed.

Howard Morris, of Milwaukee, the receiver for the West Superior (Wis.) Iron & Steel Co., has secured an order permitting him to operate the works during the remainder of his term as receiver. In December will occur the sale under foreclosure by the Central Trust Co., of New York, and John D. Rockefeller, who has the chief interest under the trust deed, will undoubtedly have his agents bid in the property. The company will then be reorganized.

No. 3 blast furnace of the Illinois Steel Co., at Joliet, has been started up after being idle several months.

The Illinois Steel Co. and the Amalgamated Association have adjusted their differences relating to the iron scale for the Bay View mills. The scale is substantially that agreed upon at Youngstown last week. One proposition of the company, pending the settlement, was to pay the men by the day, the price proposed for rolling being $10, in place of an average of $20 under the scale.

The Citizens' Savings & Loan Association, of Akron, O., one of the creditors of the Falls Rivet & Machine Co., of Cuyahoga Falls, O., has filed a petition asking for the removal of Receiver J. A. Long. It alleges that the receiver was appointed without the knowledge or consent of the plaintiff and that he has operated the plant at a loss when it could have been at a profit.

Wetherill & Co., of Chester, Pa., have received an order to build eight engines for the new power house of the Union Traction Co., at Philadelphia.

The Toledo Foundry & Machine Co., Toledo, O., has received an order for a 50-foot turntable for a 50-ton locomotive to go to Japan. It has recently shipped a steam shovel to the New Jersey & Pennsylvania Concentrating Works at Edison, N. J., for use in handling iron ore.

SEASHORE EXCURSION.

Via Pennsylvania Lines This Summer.

General excursions to the seashore at exceptional low rates will be inaugurated by the Pennsylvania Lines this summer, offering grand opportunity for delightful outings at the most popular ocean resorts on the continent. This announcement will be good news to persons who may desire to enjoy their vacation at the seaside. They may visit Atlantic City, Cape May, Avalon, Sea Isle City, Anglesea, Ocean City, Holly

Beach or Wildwood at very low fare, round trip tickets to either resort being obtainable at the same rate.

The first excursion will be run Thursday, July 15th, followed by a second four weeks later, Thursday, August 12th. Round trip rates to either Atlantic City, Cape May, Avalon, Sea Isle City, Anglesea, Ocean City, Wildwood or Holly Beach, New Jersey, will be $12.50 from Ft. Wayne and Toledo; $12 from Lima, Crestline, Tiffin, Mansfield; $11.50 from Orrville, Cleveland, Canton, Massillon, Youngstown, Girard, Niles; and $11 from Alliance.

The return limit will cover 12 days, including date of sale, which will be ample for customary ten days' vacation. For further desired information, address C. L. Kimball, Assistant General Passenger Agent, Cleveland, O., for particulars. Illustrated description of resorts to which excursion tickets will be sold, with list of hotels and boarding houses at each, will be furnished upon application.

LOW RATES.

Via Pennsylvania Lines.

Special reductions in fare over the Pennsylvania Lines will be granted for numerous events to take place this summer in various parts of the United States, in addition to local excursions. Some of the points to which tickets will be sold and dates of sale are as follows:

To Nashville, Tenn., daily to October 15th, for Tennessee Centennial and International Exposition.

To Winona Assembly Grounds, Eagle Lake (near Warsaw, Ind.), May 15th to August 31st, for Annual Assembly and Summer School.

To Indianapolis, August 17th and 18th, for Y. P. C. U. Annual Convention.

To Indianapolis, September 8th and 9th, for National Encampment Sons of Veterans.

The reduced rates over the Pennsylvania Lines will not be restricted to members of the organization mentioned, but may be taken advantage of by the public generally. Excursion tickets may be obtained at ticket offices on the Pennsylvania System and will be sold over this route by connecting railways. Any Pennsylvania Line Ticket or Passenger Agent will furnish desired information concerning rates, time of trains, return limit, and other details to all applicants, or the same may be obtained by addressing C. L. Kimball, Assistant General Passenger Agent, Cleveland, O.

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Go to Mackinac Island, Mich., via the Coast Line. The D. & C. new steel passenger steamers leave Toledo, Mondays and Saturdays, 10.30 A. M., and Tuesdays and Thursdays, 4.30 P. M. From Detroit, Mondays and Saturdays, 11.00 P. M., Wednesdays and Fridays, 9.30 A. M. Send two cents for illustrated pamphlet. Address A. A. Schantz, general passenger agent, Detroit, Mich.

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James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

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The name of the Chicago, Milwaukee & St. Paul Railway has long been indentified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company's lines.

The Chicago, Milwaukee & St. Paul Railway Company owns and operates 6,154 miles (9,900 kilometers) of railway, exclusive of second track, connecting track or sidings. The eight States traversed by the lines of the company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota, and North Dakota, possess, in addition to the advantages of raw material and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle. Many towns on the line are prepared to treat very favorably with manufacturers who would locate in their vicinity.

Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tan-bark, flax and other raw materials exist in its territory in addition to the vast agricultural resources.

A number of new factories have been induced to locate—largely through the instrumentality of this company—at towns on its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is Westward. Nothing should delay enterprising manufacturers from investigating. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

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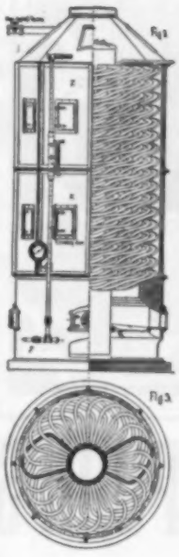

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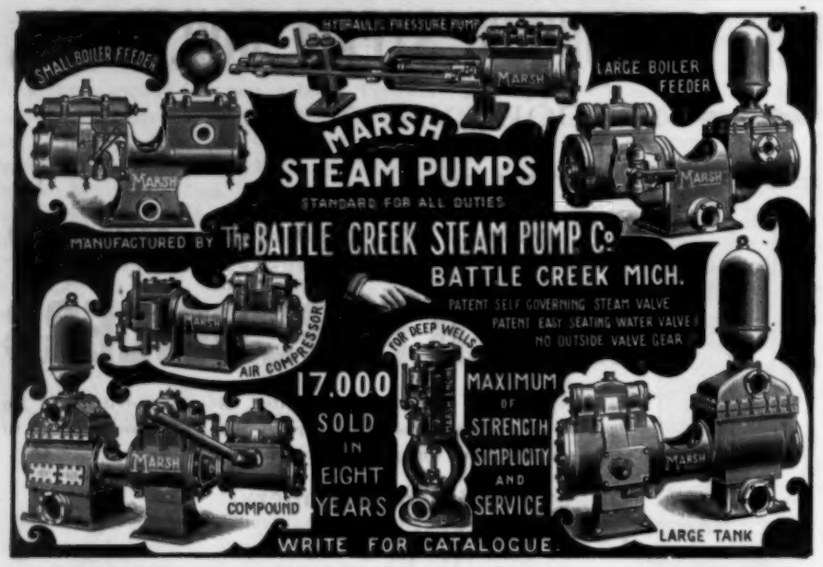

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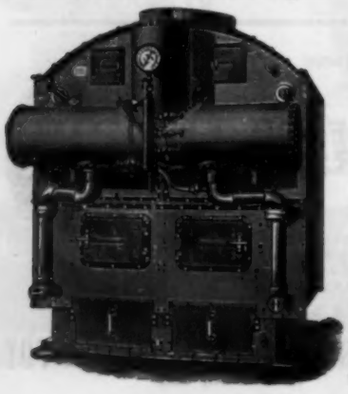

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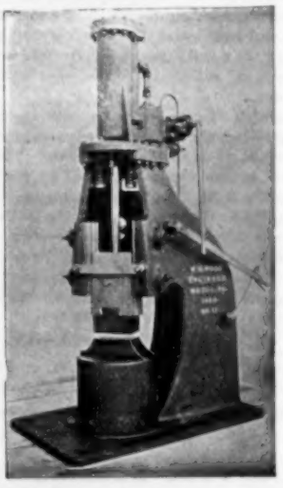

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Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:40 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

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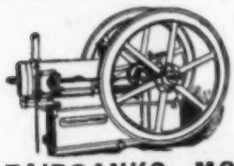

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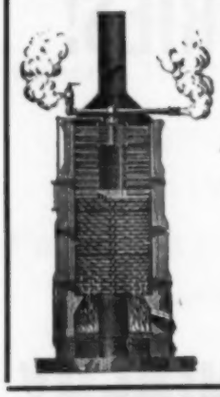

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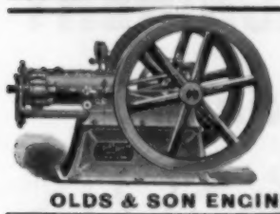

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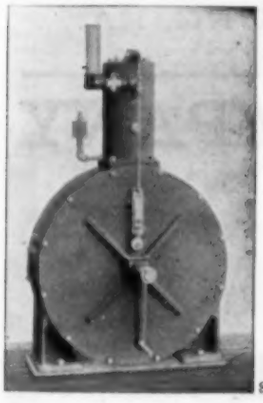

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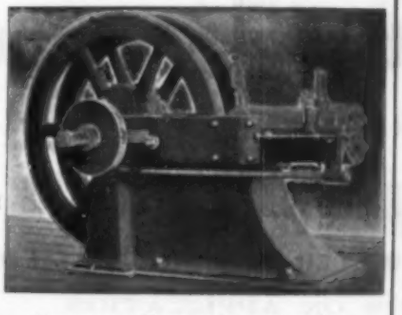

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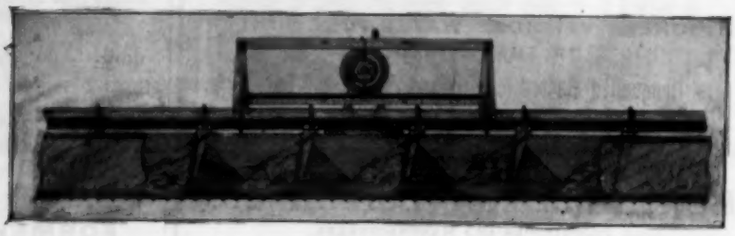

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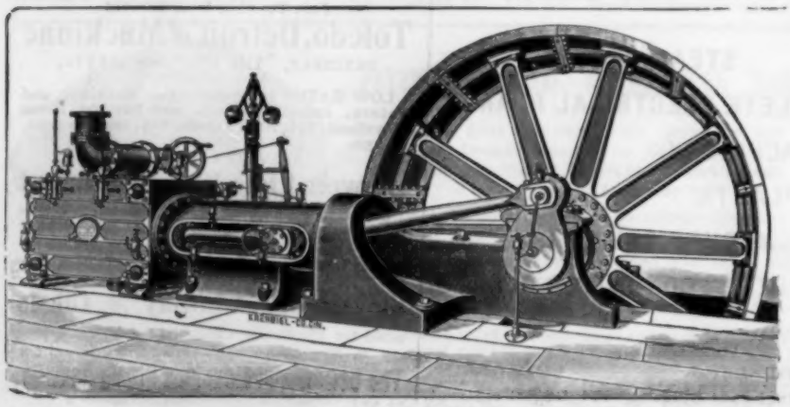

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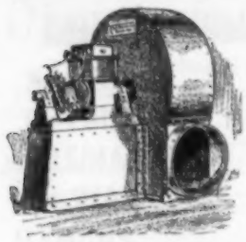

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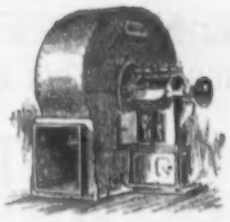

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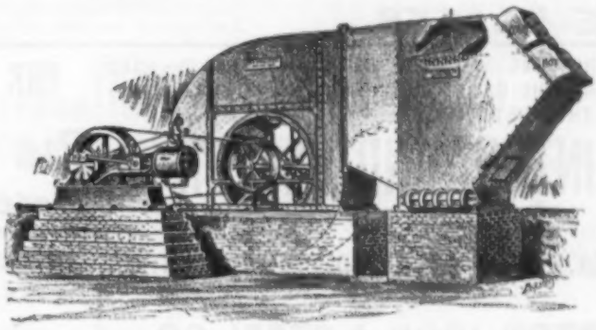

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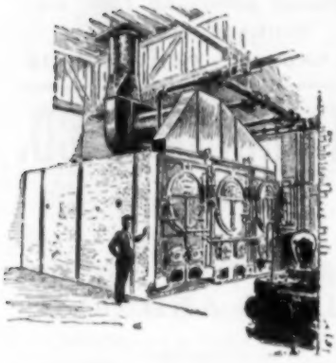

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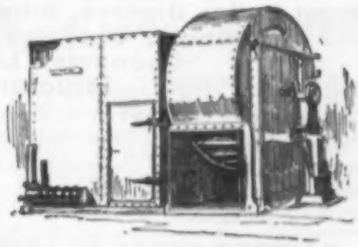

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Lorain Foundry Co., Lorain, O.
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Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

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Otis Steel Co., Cleveland, O.

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Cambria Iron Co., Johnstown, Pa.

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Ætna-Standard Iron & Steel Co., Bridgeport, O.

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Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
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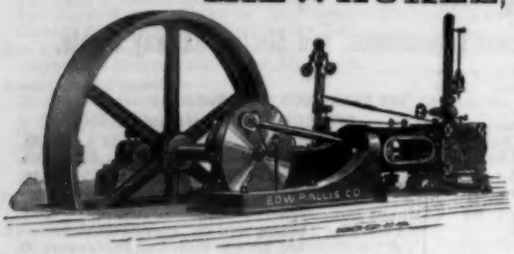

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	$3.40@ 3.46
No. 1 specular, Bessemer	3.05@ 3.17
No. 1 Bessemer hematite	2.60@ 2.90
Hematites No. 1 non-Bessemer	2.00@ 2.25
No 1. Specular, non-Bessemer	2.40@ 2.60

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$ 9 65
No. 1 Strong Foundry	10 25@ 10 65
No. 2 Strong Foundry	9 65@ 10 15
No. 1 Gray Forge, red short	8 65
No. 2 Gray Forge, neutral	8 75
No. 1 American Scotch	10 40
No. 2 American Scotch	10 15
Lake Superior Charcoal	12 75@ 13 00
PITTSBURG:	
No. 1 Foundry	$10 25@ 10 50
No. 2 Foundry	9 50@ 9 75
Gray Forge	8 25@ 8 50
White and Mottled	8 50
Warm Blast Charcoal	14 50@ 15 00
Cold Blast Charcoal	17 00
Bessemer	9.35@ 9 50
CHICAGO:	
Lake Superior Charcoal	$13 00@$13 20
Local Coke Foundry No. 1	10 25@ 10 75
Local Coke Foundry No. 2	10 25@ 10 50
Local Coke Foundry No. 3	10 00@ 10 25
Local Scotch Foundry No. 1	10 50@ 10 75
Local Scotch Foundry No. 2	10 25@ 10 50
Local Scotch Foundry No. 3	10 00@ 10 25
Southern Coke No. 1	10 75@ 11 00
Southern Coke No. 2	9 85@ 10 10
Southern Coke No. 3	9 60@ 9 85
Southern No. 1 Soft	10 35@ 10 60
Southern No. 2 Soft	9 85@ 10 35
Southern Silveries	10 35@ 10 60
Jackson Co. Silveries	12 50@ 14 50
Ohio Silveries No. 1	@
Ohio Strong Softeners	12 00@ 12 25
Alabama Car Wheel	16 50@ 16 00
Malleable Bessemer	10 75@ 11 00
Coke Bessemer	11 50@ 12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$ $ 9 70
Southern Coke No. 2 and No. 1 Soft	9 50
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	14 50@ 15 50
Tennessee Charcoal No 1	12 50@ 13 00
Jackson County Silvery No 1	12 50@ 13 00
Southern Coke, Gray Forge	8 00@ 8 25
" " Mottled	8 00
Standard Georgia Car Wheel	14 25@ 15 00
Tennessee " "	13 00@ 14 00
Lake Superior " "	14 75@ 15 25
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$10 50@10 75
No. 2 Foundry Strong Coke Iron Lake Superior Ore	10 25@10 50
Ohio Strong Softener No. 1	10 50@10 75
Jackson Co. Silvery No. 1	13 50@14 00
Lake Superior Charcoal	14 00
Southern Soft No. 1	10 75
Hanging Rock Charcoal	17 00
ST. LOUIS:	
Southern Coke No 1	$ 9 50@$ 9 75
Southern Coke No. 2	9 00@ 9 25
Southern Coke No. 3	8 50@ 8 75
Southern Gray Forge	8 00@ 8 25
Southern Charcoal No. 1	13 00
Missouri Bessemer	12 00
Ohio Softeners	13 50
Lake Superior Car Wheel	14 50
Southern Car Wheel	14 50

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$10 50
Old steel rails (6 ft. and over)	9 25
Old steel rails (6 ft. and under)	8 75
Old car wheels	9 25
	NET TONS
No. 1 R. R. wrought scrap	$ 9 00
Mill scrap	6 75
No. 1 Machine cast scrap	8 00
Iron axles	12 00
Axle turnings	7 00
Wrought turnings (free from cast)	5 50
Cast borings	4 50
Uncut wrought iron boilers	3 50
Steel boiler plates	7 00
Grate bars	5 00
Pipes and flues (clean)	6 50
Tank iron	7 00
Hoop and band iron	5 00
Sheet iron	5 00
Wrought drillings	5 00
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.10c
Angles	1.05c
Tees	1.15c
Universal Plates	1.10@1.15c
Sheared Plates	1.15c

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[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅞	1.00 Base
2 to 2⅞	.20 extra
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6⅛ to 6½	2.30 "

PERFORATED METALS

OF ALL KINDS FOR

MILLING, MINING AND AGRICULTURAL MACHINERY.

Perforated Iron, Steel, Copper, Brass, Tin, Zinc, Lead, Etc., to Order.
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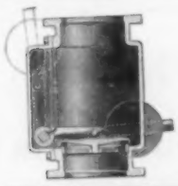

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This valve has no dash pots, springs, guides or complicated levers to get out of order. It is simple, reliable and well made. Never sticks, and can be relied upon at all times when using exhaust steam for heating; or when used as a relief, or free exhaust on a condensing plant, it has no equal. It is noiseless and free from any complicated attachments.

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Producers of SILICA, FIRE and CORE SAND. Also MOLDING SAND for STEEL CASTINGS. Write for Prices.

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THE GOBEILLE PATTERN CO., Cleveland.

THE 1896 EDITION

OF THE

Iron and Steel Directory

Will be sent postpaid by *The Iron Trade Review* at $6.

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works.

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This is a case in which familiarity breeds business.

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Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

6⅝ to 7¾	2.50 extra.
¾ to ⅞	.10 "
⅞ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1⅛ to 4 x ⅜ to 1	1.05 Base.
4⅛ to 6 x ⅜ to 1	.10 extra.
6⅛ to 8 x ⅜ to 1	.60 "
8⅛ to 10 x ⅜ to 1	.80 "
1⅛ to 4 x 1 1-16 to 1½	.30 "
4⅛ to 6 x 1 1-16 to 1½	.40 "
6⅛ to 8 x 1 1-16 to 1½	.60 "
8⅛ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅝ to 2	.50 "
4⅛ to 6 x 1⅝ to 2	.60 "
6⅛ to 8 x 1⅝ to 2	.80 "
8⅛ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4⅛ to 6 x 2⅛ to 3	.80 "
6⅛ to 8 x 2⅛ to 3	1.00 "
1⅛ to 1⅜ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅝	.20 "
⅝ to 15-16 x ⅜ to ¾	.40 "
⅝ to 11-16 x ⅝ to ⅞	.50 "
⅞ to 9-16 x ⅝ to ⅞	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4½ to 6 x ¼ to 5-16	.30 "
1⅜ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
⅝ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
⅝ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4½ to 6 x No. 9 to 3-16	.50 "
4½ to 6 x Nos. 10, 11 and 12	.60 "
1⅜ to 4 x No. 9 to 3-16	.40 "
1⅜ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in. .70

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅞ to 1¼	.40 extra.
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅜ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes 1 c extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.90 Base.
		Extras.
1⅛ to 6,	" 10, 11, 12 or 1/4"	.05 per 100 lbs.
1 to 1⅜,	" 7, 8, 9 or 3-16"	.10 "
1 to 1⅜,	" 10, 11, 12 or 1/4"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or 1/4"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10 11, 12 or 1/4"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10 11, 12 or 1/4"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or 1/4"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-19	" 10, 11, 12 or 1/4"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or 1/4"	1.05 "

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.	
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base
		Extras
1 7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs.
1 7-16 to 2,	" 20	.10 "
1 7-16 to 2,	" 21	.15 "
1 7-16 to 1¾,	" 22	.25 "
1 ⅛ to 1⅜,	" 13, 14 and 15	.05 "
1⅛ to 1¾	" 16, 17 and 18	.10 "

CUT GEARS

FOR

HEAVY DUTY

Are Wonderful Economizers of Power.

Have you looked into this?
If not, it will pay to do so.
Then write us for prices.

This is a 4-inch Circular Pitch.

We Cut Involute, Epicycloidal or Special Teeth.

R. D. 99 ALLEGHENY,

Nuttall Co., Grant Ave., PA.

Spur, Bevel or Spiral Gears. **Racks, Quadrants and Worm Gearing.**

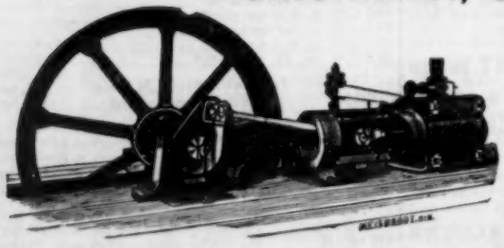
F. A. ESTEP, Pres. & Treas. J. R. McGINLEY, Vice Pres't. THOS. FAWCUS, Supt.

Persistence in Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines,

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

1¼ to 1⅜,	"	19 and 20	.15 per 100 lbs.
1¼ to 1⅜,	"	21	.20 "
1¼ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos. 13, 14 and 15		.20 "
⅞,	" 16, 17 and 18		.25 "
⅞,	" 19 and 20		.30 "
⅞,	" 21		.35 "
⅞,	" 22		.45 "
¾ and 13-16	Nos. 13, 14 and 15		.30 "
¾ and 13-16	" 16, 17 and 18		.35 "
¾ and 13-16	" 19 and 20		.40 "
¾ and 13-16	" 21		.45 "
¾ and 13-16	" 22		.50 "
¾ and 13-16	" 23		.60 "
11-16,	Nos. 13, 14 and 15		.35 "
11-16,	" 16, 17 and 18		.40 "
11-16,	" 19 and 20		.50 "
11-16,	" 21		.60 "
11-16,	" 22		.70 "
11-16,	" 23		.80 "
⅝,	Nos. 13, 14 and 15		.40 "
⅝,	" 16, 17 and 18		.45 "
⅝,	" 19 and 20		.55 "
⅝,	" 21		.65 "
⅝,	" 22		.75 "
⅝,	" 23		.85 "
9-16,	" 13, 14 and 15		.45 "
9-16,	" 16, 17 and 18		.50 "
9-16,	" 19 and 20		.60 "
9-16,	" 21		.70 "
9-16,	" 22		.80 "
9-16,	" 23		.90 "
½,	" 13, 14 and 15		.55 "
½,	" 16, 17 and 18		.60 "
½,	" 19 and 20		.70 "
½,	" 24		.80 "
½,	" 22		.90 "
½,	" 23		1.00 "
7-16,	" 13, 14 and 15		.80 "
7-16,	" 16, 17 and 18		.90 "
7-16,	" 19 and 20		1.00 "
⅜,	" 13, 14 and 15		1.00 "
⅜,	" 16, 17 and 18		1.10 "
⅜,	" 19 and 20		1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

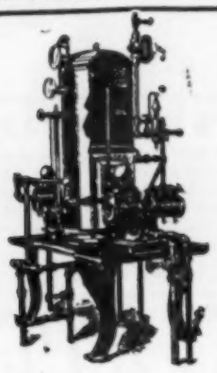
The Link-Belt Machinery Co.

ENGINEERS. FOUNDERS. MACHINISTS.

CHICAGO, U. S. A.

Modern Methods as applied to the handling of Iron Ore, Coal, Raw and Manufactured Products.

Manila Rope, Power Transmissions, Shafting, Pulleys, Shaft Bearings, Gearing Friction Clutches, etc.



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BURNING FUEL OIL.

Heats and cleans the oil and delivers it to the fires under high and uniform pressure.

Entirely automatic, most scientific, sensible and economical method of burning oil in existence. If you are operating a Steel Works, Brass or Copper Rolling Mill, Malleable Iron Works, Bolt and Nut Works, Bicycle Works, or do Annealing, Forging, Brazing, Tempering, Japanning, Enameling, Case Hardening, you can use this machine to your advantage.

WE BUILD FURNACES OF ALL KINDS. SATISFACTION GUARANTEED.

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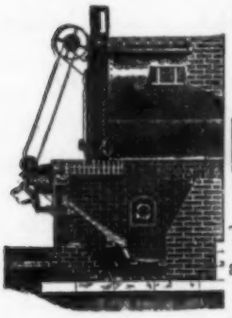
26 CORTLANDT STREET, NEW YORK.

H. H. CAMPBELL.



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SOLE MANUFACTURERS OF THE

Brightman Mechanical Stoker
FOR STEAM BOILERS.

THE MOST ECONOMICAL IN FUEL

and the Best Device in the World for Preventing Smoke.

Send for Catalogue "A."

STUART FIRE BRICK CO.

MANUFACTURERS OF

Silica Brick

For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.

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The Chicago & North-Western Railway

REACHING with its 7,966 miles of road the famous Water Powers, Coal Fields, Iron Ore Ranges, Hard and and Soft Lumber Districts located in Illinois, Wisconsin, Michigan, Iowa, Minnesota, South Dakota, North Dakota, Nebraska and Wyoming, and by traffic arrangements with other railways, 7,350 stations located on 41,000 miles of railroad (one-ninth of the entire railroad mileage of the world, and one-fourth of the railroad mileage of the United States), has on its line more industries than any other western railroad.

Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

M. HUGHITT,
General Freight Agent,
CHICAGO.

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats. cts. lbs.

2 to 9-16 in. wide by 2 to ½ thick .08

Bessemer and O. H. Steel.

Bessemer Machinery, base price,	1 40
Open-hearth Tire "	1 45
Open-hearth Spring "	1 80
Sleigh Shoe "	1 45
Toe Calk "	1 90
Cutter Shoes, tapered and bent "	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON. cts. lbs.

1 to 2 in. inclusive	.08
9-16 to ½ in. "	.08
7-16 to ⅜ and 2⅜ to 3 in	.09
3⅛ to 4 in	.09½
⅝ to 11-16 and 4⅛	.10
⅛ to 6 in	.10½
¾ to 9-32 and 6⅛ to 7 in	.11
1 in	.13

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, four ins	.62
Butt " " " four ins	.62½
Lap " galv. " four ins	.52½
Butt " " " four ins	.50
Boiler tubes 2¼" and smaller	.70
Boiler tubes 2½" and larger	.75
Casting screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anti-Friction Metals.

Magnolia Anti Friction Metal, 25 cts. per lb., f. o. b. New York or Chicago.

No Name Metal, 18 cts. per lb., f. o. b. New York or Chicago.

Mystic Metal. 8 cts. per lb., f. o. b. New York or Chicago.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 5 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shults Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shults Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 80
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills

Morse Taper & Straight Shank to 1⅜"	dis 50 & 10 to 60
Morse Taper and Straight Shank Larger than 1⅜"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, F. F
Kegs, ℔ lb	4¾c	5 c	2¾c
½ kegs ℔ lb	4¾c	5¾c	2¾c
¼ kegs ℔ lb	5 c	5¾c	3 c
10 lb cans, 10 in case	6 c	6¾c	5 c
10 lb cans less than 10	10 c	10 c	¾c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 50@50&5
H. H. Barton ..... dis 50@50&5

Emery Wheels.

Detroit ..... dis 60@70
Norton's ..... dis 60@70
Grant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 50
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@70
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs 10c
" " " " over 5 lbs 8c

Jack Screws.

Illinois Bolt Co. list ..... dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15⅝	11⅛	8⅛	6	5⅛	5⅛	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ℔ keg, base.
{ Car lots $1.30
{ Less than car lots ... $1.40

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10&10&10

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in ..... ds 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

New List, Apr. 9, 1894

Brass ..... dis 35c
Copper ..... dis 35c
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75&5
" " Nos. 27@36 ..... dis 75&10&5
Coppered Nos. 0 to 18, market list ..... dis 70@70&5
Galvanized Nos. 0 to 18 " " ..... dis65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ℔ lb dis 30

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BUILDING DEPARTMENT.

SPECIALTIES: Steel and Iron Buildings for Rolling Mills, Tin Plate Plants, Steel Works, Foundries, Factories, Roof Trusses, Girders, Columns, Beams, Corrugated Iron, Etc.

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Tinning MACHINERY.

Rolling Mills, Sand and Chill ROLLS.

WORLD'S FAIR AWARD

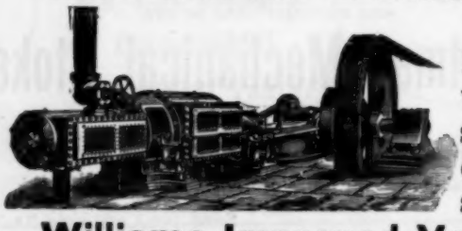
We are the only Steel Roofing Co. awarded Medal and Diploma for **PATENT CAP ROOFING** at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES IRON & STEEL ROOFING CO., Chicago and Niles, O.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

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For Direct Electrical and all High Class Work.

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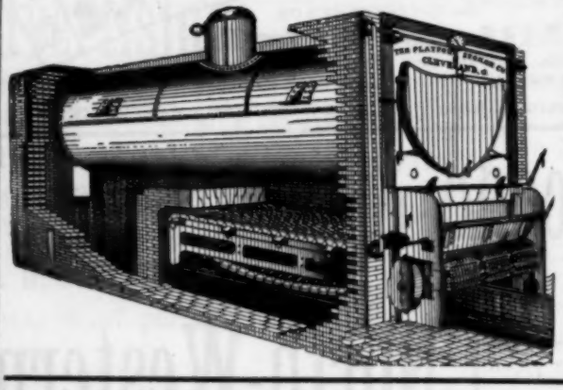
E. F. WILLIAMS.

Park Building, Pittsburg,
SEWARD S. BABBITT.



The Playford Mechanical Stoker

Guaranteed to

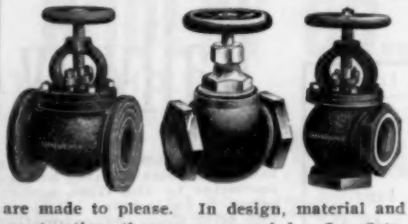
Abolish smoke, to increase boiler capacity and to save fuel.

For information, address,

The Playford Stoker Co.,

No. 61 Case Library Bldg.,
CLEVELAND, O.

LUNKENHEIMER'S IRON BODY VALVES



are made to please. In design, material and construction, they are unequaled. Our Catalogue presents a big variety—free upon request.

All our iron body valves are made in standard sizes, and are warranted strictly first class.

Specify LUNKENHEIMER'S make and get the best.

THE LUNKENHEIMER COMPANY,

Cincinnati, Ohio, U. S. A.

SOLE MANUFACTURERS.

26 Cortlandt St., NEW YORK. } BRANCHES { 35 Great Dover St. LONDON, S. E.

BELT DRIVEN DIRECT DRIVEN
DYNAMOS AND MOTORS
SLOW SPEED HIGH GRADE

THE CARD ELECTRIC CO.
MANSFIELD, OHIO. U.S.A.

If you are thinking of enlarging your mill, foundry or machine shop, or of purchasing machinery of any kind, send us a line giving character of machinery needed. We can put you in communication with manufacturers from whom you can buy advantageously.

J. M. ALLEN, President.
WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
T. B. PIERCE, Secretary and Treas.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.
HARTFORD, CONN.

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J. E. WOLCOTT, Special Agent, Room 32, Wilshire Bldg., Cleveland, O.

CLEVELAND ELECTROTYPE CO.
ELECTROTYPING ENGRAVING AND STEREOTYPING.
50 HIGH ST. — TEL. 2139.

ESTABLISHED 1854.
PETER GERLACH & CO.,
MAKERS OF
Saws, Tools and Machinery.
Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts.
Cleveland, Ohio, U. S. A.

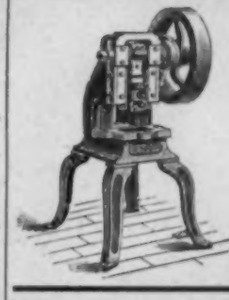
THE BETHLEHEM IRON CO.,
WORKS AND PRINCIPAL OFFICE,
SOUTH BETHLEHEM, PENNA.

RAILS, BILLETS, MUCK BARS.

FORGINGS of all descriptions, either Solid or Hollow, made from Fluid-Compressed, Hydraulic Forged Open Hearth Steel.
PLATES for all purposes..

NEW YORK OFFICE, 100 BROADWAY. PHILADELPHIA OFFICE, 421 CHESTNUT ST.
CHICAGO OFFICE, MARQUETTE BUILDING.

PERKINS POWER PRESSES
WILL DO
Heavier work weight for weight than any other Press on the Market.



PERKINS MACHINE CO.,
SALEROOMS: Hill, Clarke & Co., Chicago and Boston.
FACTORY: K and East 1st Sts., South Boston, Mass.

TOLEDO MACHINE & TOOL CO.,
501-505 Superior St., Toledo Ohio.
We manufacture
Power Punches. Forging Presses.
Power Presses. Trimming Presses.
Straight Sided Double Pitman Presses.
Drop Presses.
Embossing Presses. Automatic Feed Presses.
Stamping Presses. Power Slitting Machines.
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Special and Automatic Machinery Dies for all classes of work in sheet metals.
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